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REGISTER
OF THE
BALTIMORE POLYTECHNIC
INSTITUTE

1915--1916

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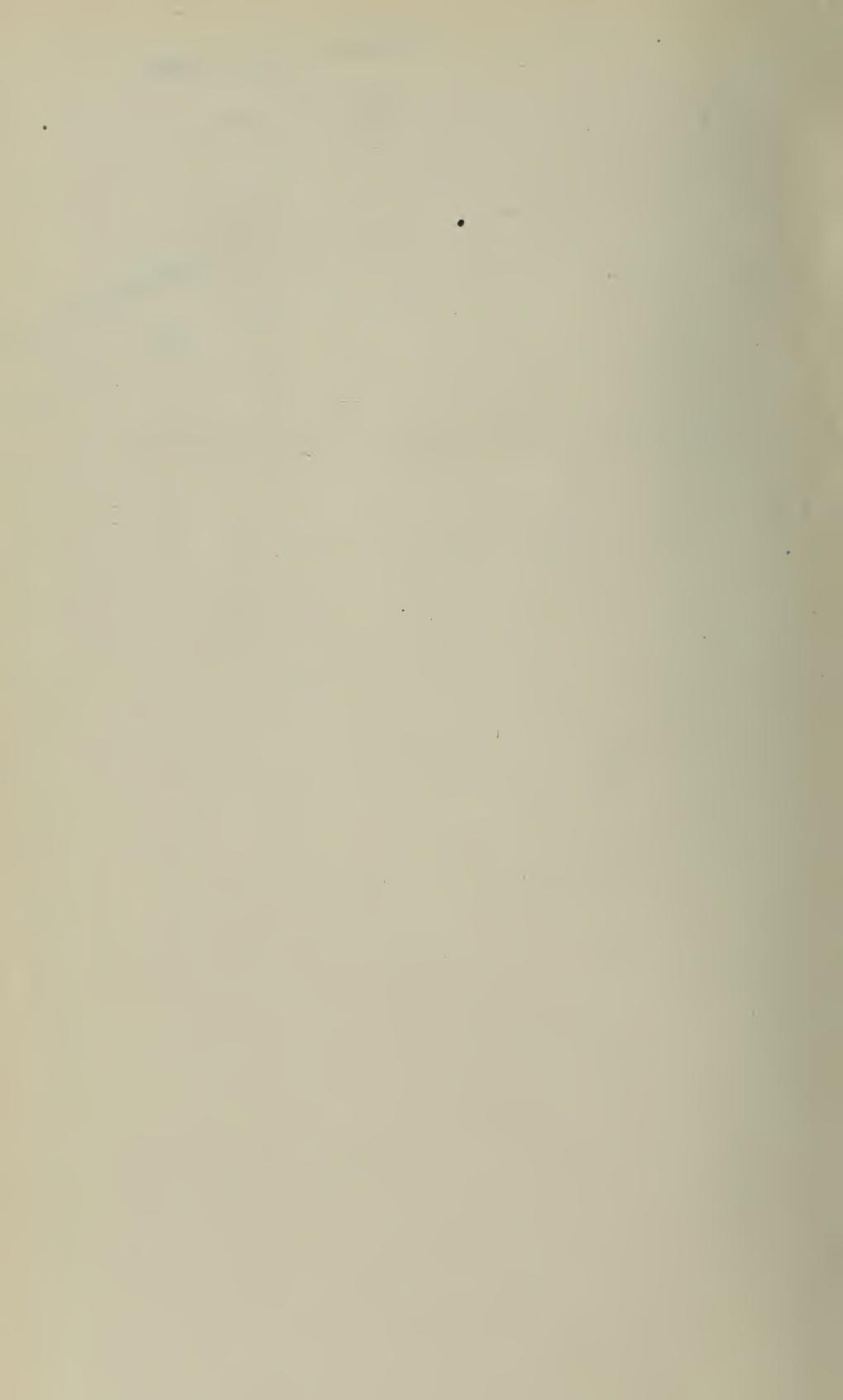
OF THE

Baltimore Polytechnic Institute

200-240 E. NORTH AVENUE

THIRTY-FIRST ACADEMIC YEAR

1915-1916



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BALTIMORE POLYTECHNIC INSTITUTE.

HISTORICAL SKETCH.

The Baltimore Polytechnic Institute, a secondary technical school maintained by the City of Baltimore, was the second educational institution in the United States to establish manual training as a part of the course of a public school system.

Although it is believed that tentative efforts to ingraft manual training upon the City's school system were made as early as 1873, yet the action which led to the establishment of this school was not taken until April, 1883. At a meeting of the Board of Commissioners of Public Schools, held on the 24th of that month, Mr. Joshua Plaskitt, Commissioner for the Ninth Ward, offered a resolution for the appointment of a committee "to consider—the advisability of establishing a school or schools for manual training." The resolution was adopted, and the committee thus appointed recommended the establishment of a school "for manual education." The necessary enabling ordinances and enactments having been passed by the City Council of Baltimore and by the General Assembly of Maryland, the school was organized and opened on the Courtland Street site, on February 26, 1884, under the name of "Baltimore Manual Training School" with Dr. Richard Grady as Director.

In January, 1886, the faculty was reorganized, Lieutenant John D. Ford of the Engineer Corps of the U. S. Navy, who had been detailed for duty at the school, becoming Principal.

From the opening of the school applicants for admission had been required to pass through the eighth grade of the elementary schools, or to show satisfactory evidence of having had equivalent instruction; but in September, 1888, it was decided to admit pupils of the sixth, seventh and eighth elementary grades. This action opened the school to so large a

number that increased accommodations became imperative, and in June, 1890, a new building, devoted to the academic studies and drawing, was erected and occupied.

Lieutenant Ford was recalled to the naval service in June, 1890, and was succeeded as Principal by John W. Saville, a retired member of the Engineer Corps of the Navy.

In May, 1893, the name of the school was changed to "Baltimore Polytechnic Institute," and the titles of Principal and Vice-Principal to President and Vice-President, respectively.

Mr. Saville resigned in August, 1899, and was succeeded as President by Lieut. William R. King, Engineer Corps, U. S. Navy, the present head of the school.

Early in 1900 a comprehensive and exhaustive report discussing the conditions, needs and aims of the school, and recommending certain changes in the requirements for admission and in the curriculum, was submitted to the Board of School Commissioners by the Board of Visitors, a body created by a provision in the new charter of the City of Baltimore which went into effect on March 1st, 1900. The partial adoption of this report in September, 1900, excluded elementary school pupils from the Institute, thus making the requirements for admission the completion of the course prescribed for the elementary schools.

In May, 1902, the course was made, by action of the Board of School Commissioners, four years in length for all entries on and after September 15, 1902.

By operation of the new charter the titles of President and Vice-President were changed to Principal and Vice-Principal.

The enrollment becoming greater than the buildings on Courtland street could accommodate School No. 46 on Division street was fitted as an annex in 1908, and in September of that year the first-year class was there accommodated.

In order to provide for the continued growth of the Institute, the City Council, by an ordinance approved April 19, 1909, directed the Mayor, the City Comptroller, and the President of the Board of School Commissioners to acquire

by purchase the property on North avenue then occupied by the Maryland School for the Blind. That property, containing nearly six acres, was subsequently purchased for \$345,000, and plans were instituted for the erection of a building to provide for an ultimate accommodation of 2,000 students, but the subsequent opening of Calvert street through the grounds compelled the modification of the plans to their present dimensions, which provided for the possible accommodation of 1,500 students.

The main building on the North avenue property having been altered in accordance with the architect's plans for the new Institute, the first-year class was moved there from the Division street annex on December 5, 1910.

On March 17, 1911, ground was broken on the North avenue site, and on September 22, 1913, the new building was occupied for the session of 1913-1914.

BOARD OF SCHOOL COMMISSIONERS.

THOMAS McCOSKER, *President*,
JAMES M. DELEVETT,
ALBERT T. CHAMBERS,
SIDNEY P. THANHouser,
RICHARD J. BIGGS,
ALBERT L. FANKHANEL,
COL. CLARENCE DEEMS,
ARTHUR B. BIBBINS,
JAMES W. CHAPMAN, JR.

BOARD OF VISITORS.

ABRAM H. COLMARY, *Chairman*,
FREDERICK W. WOOD,
FREDERICK J. MAYER,
JAMES L. MURRILL,
WILLIAM H. ROTHROCK,
FREDERICK H. WAGNER.

SUPERINTENDENT OF PUBLIC INSTRUCTION.

CHARLES J. KOCH.

FACULTY.

WILLIAM R. KING, U. S. N. (Retired),
Principal.

WILLIAM H. HALL, A. M.,
Vice-Principal.
Head of Department of Science.

HENRY A. CONVERSE, Ph. D.,
Head of Department of Mathematics.

CHARLES E. CONWAY.
Head of Department of Engineering.

PHILIP DOUGHERTY, A. M.,
Head of Department of History and Civics.

GEORGE S. WILLS, A. M.,
Head of Department of English and German.

ROSA LEBOVITZ,
Secretary.

FACULTY AND STAFF BY DEPARTMENTS.
IN ORDER OF APPOINTMENT.

DEPARTMENT OF ENGINEERING.

CHARLES E. CONWAY, *Head of Department.*

WILLIAM G. RICHARDSON,
GEORGE M. GAITHER,
SAMUEL P. PLATT,
ALLEN L. MALONE.
ALLEN B. SOUTHER, B. S.,
HENRY BOGUE, JR., A. B.,
GEORGE N. ANDERSON,
LAURANCE F. MAGNESS,
CLARENCE P. BOLGIANO,
HARRY C. FINCK,
JULIUS ZIEGET, C. E., LL.B.,
WILMER A. DEHUFF, C. E.,
CHARLES A. PETTIT,
CHARLES F. GOOB,
CYRIL H. A. MARKLEY,
CHARLES E. DENNIS, JR.,
WALTER SIMON,
EDWARD LEROY LONGLEY,
WALTHER H. FELDMANN,
GUSTAV W. KLEMM,
JOHN RAY HARDIN,
HERMAN WOLF,
WILLIAM E. LEHR.

DEPARTMENT OF MATHEMATICS.

HENRY A. CONVERSE, Ph. D., *Head of Department.*

OLIVER BACHARACH,
HARVEY S. HOUSKEEPER, A. B.,
THOMAS F. GAREY, A. M.,
WILLIAM H. WILHELM, A. M.,
ALFRED B. HAUPT, A. B.,
MAX F. LEHMAN, A. M.,
A. E. SABLE, A. M.,
JAMES N. GALLOWAY, A. M.,
A. H. CHANDLER, A. B.,
ALEXANDER C. ROBINSON, A. B.,
ERNEST T. McNUTT, A. B.

DEPARTMENT OF SCIENCE.

WILLIAM H. HALL, A. M., *Head of Department*,

J. EDWARD BROADBELT, Ph. G.,

IRVING L. TWILLEY, A. M.,

JAMES B. ARTHUR,

J. VINTON HOBBS,

E. HOWARD ASKEW,

G. ROSS REDE,

LUTHER B. MILLER, A. B.

DEPARTMENT OF ENGLISH AND GERMAN.

GEORGE S. WILLS, A. M., *Head of Department*,

J. WARD WILLSON, M. D.,

EDWARD REISLER, A. M.,

ELMER M. HARN, A. M.,

WILLIAM P. STEDMAN, A. B.,

GEORGE H. SCHWARTZ, A. B.,

HARRY P. PORTER, A. M.,

HARRY L. CAPLES, A. B.,

WILLIAM J. MILLER, A. M.,

JOHN G. SOHN,

ERNEST R. SPEDDEN, Ph. D.

DEPARTMENT OF HISTORY AND CIVICS.

PHILIP DOUGHERTY, A. M., *Head of Department*:

ISAAC L. OTIS, A. B.,

CHARLES F. RANFT, A. M.,

CHARLES E. ADAMS, Ph. B.,

GEORGE W. WARD, Ph. D.

CALENDAR, 1915-1916.

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- September 14, 1915, Tuesday..... Opening of Session.
November 12, Friday..... First Quarter ends.
November 15, Monday..... Second Quarter begins.
November 25, Thursday..... Thanksgiving Day.
December 24, Friday..... Christmas Vacation begins.
January 3, 1916, Monday..... Session resumed.
January 14, Friday..... Second Quarter ends.
January 17, Monday..... Semi-annual Examinations begin.
February 1, Tuesday..... Third Quarter begins.
February 22, Tuesday..... Washington's Birthday.
March 21, Tuesday..... Third Quarter ends.
March 22, Wednesday..... Fourth Quarter begins.
April 20, Thursday..... Easter Vacation begins.
April 25, Tuesday..... Session resumed.
May 17, Wednesday..... Annual Examinations begin.
May 30, Tuesday..... Decoration Day.
June 20, Tuesday..... Commencement Day.
September 13, Wednesday..... Opening of Session.
November 10, Friday..... First Quarter ends.
November 13, Monday..... Second Quarter begins.
November 30, Thursday..... Thanksgiving Day.
December 25, Monday..... Christmas Vacation begins.

**COURSE OF STUDY AND GENERAL STATEMENT OF
PLAN AND PURPOSE.**

The primary aim of the Institute is to give its students something more than fundamental instruction in applied science. It aims to prepare for intelligent service in the engineering professions—the professions to which the world is indebted for all the conveniences of life and for the economic production of its necessities.

The course of study is designed to accomplish the following purposes:

1. To give a sound fundamental practical education to students whose inclinations and circumstances preclude a college course.

2. To give to youth that healthful and highly valuable manual training which broadens education and conduces to dexterity, contrivance and invention.

3. To give to students in the third and fourth years such studies in Engineering, Mathematics, Physics, Chemistry, and such practical exercises at the machine, bench and in laboratories as will fit them:

(a) For immediate and remunerative employment in the wide field of civil, mechanical, electrical, chemical and mining engineering, where their training will lead to rapid advancement.

(b) For entrance to advanced standing into higher institutions of technology, should a higher technical education be desired.

That these objects are being attained is abundantly proved by the experiences of the graduates who enter immediately into the activities of engineering life, and from the fact that those graduates who enter higher institutions are invariably received to at least one year of advanced standing in the courses leading to the engineering degrees.

For the attainment of the objects of the course there is one carefully planned course of study, no effort being made to specialize until the fourth year, by which time a student will have acquired a considerable degree of practical skill and intimate knowledge in some one of the professions based on mechanical art and applied science that he may have elected to follow. Thus, in the fourth year in the subject of Design, the student may select examples of mechanical, electrical or civil engineering designs, the amount of such practice being limited only by the capacity of the student and the time available. Extra opportunities in the laboratories are offered advanced students for more extended investigations than those demanded by the course.

No attempt is made to teach trades, but the equipment is of such nature that the instruction given in the shops necessarily results in the acquirement of a considerable degree of manual dexterity, though designed to be correlative to the work in the class room. It is believed that instruction in correct methods of using tools and practical illustrations of how, and for what purpose, things are done, are of more value than mere excellence in hand skill.

In the department of English and German, instruction in English is given throughout the four years, and in German throughout the first three. The course in English comprises the theory and practice of composition and the reading and study of selections from representative British and American authors, including the college entrance requirements. The work in composition is designed to give the student a practical knowledge of the ordinary forms of discourse and to train him in expressing his thoughts with ease and accuracy. To this end he is given frequent exercises in writing, the subjects, for the most part, being taken from his daily experience and from his work in the other departments of the school. The course in literature is designed, not only to meet the college entrance requirements, but to cultivate in the student such tastes as will lead him in his reading to choose books that are worth while.

The course in German comprises drill in the fundamental principles of grammar, and as wide a reading in selected texts as is possible. The course is not designed to give a speaking knowledge of the language, but such knowledge as will enable the pupil to read German easily, and successfully to pursue advanced courses in the study of the language.

In the department of History and Civics, instruction is given during the first and second years. The course includes about one-half of the work prescribed by the Committee of Seven, the first year being devoted to English History, and the second year to American History and Civics.

In Mathematics, care is taken at the beginning of the first year to discover and correct defects in fundamental training, after which the course of instruction proceeds in Algebra, Geometry, Trigonometry, Analytic Geometry, Descriptive Geometry and the Differential and Integral Calculus.

In the Department of Science, the work of the second year in Physics is the regular high school course, consisting of class room instruction and individual work in the laboratory, the laboratory practice being, as far as possible, conducted so as to permit all the students to perform the same experiment simultaneously. The Physics of the third year is more advanced and is really of college grade, the mathematical laws and derivation of formulas being prominent features. The laboratory work for this year is of a higher grade, but the experiments are not performed simultaneously, the expensive nature of the apparatus limiting the equipment to one set for each experiment. The apparatus for laboratory work in Physics is about the same as would be found in any well-equipped high school, with the addition of some pieces of better grade, such as a spectrometer, with micrometer scale; diffraction gratings; linear expansion apparatus; siren and other apparatus for study of sound. The tables are connected to gas supply and have conductors leading to the switchboard in the electrical laboratory, where connections may be made to supply current of any nature or voltage, all tables in this laboratory being connected, however, to the same supply at one time.

Electricity is treated as a distinct branch in the third and fourth years. The work of the third year is chiefly theoretical, the fundamental laws and principles being given careful consideration with the object of laying the foundation for practical applications in the fourth year. The laboratory work of the third year consists of tests tending to familiarize the student with the apparatus and especially with making connections according to diagram and with the proper interpretation of results. The work of the fourth year in electricity is of a commercial and practical nature. The direct current generator and motor are studied systematically, experimental determination of losses and efficiencies being emphasized. Commercial lighting, especially modern systems, is given a prominent place. The electric railway, including line and car equipment, is given about three weeks' time, which is sufficient for the essentials. The theory of the transformer is discussed, experiments performed to illustrate its action, tests made for losses, and efficiencies at various loads calculated, all of which is followed by a general discussion of its action under varying conditions.

The latter part of the fourth year is devoted to the study of alternating current generators, motors, and transmission and distribution. Calculations are made for generators, three-phase constants derived, transformer connnections for poly-phase lines shown, and the power of three-phase currents calculated. Under the head of distribution are considered some of the modern transforming and control appliances, such as the rotary converter, constant current transformer, mercury arc rectifier and the feeder potential regulator.

The equipment of this work is partly in the Mechanical Laboratory, the main switchboard and the generators being especially adapted to experiment. This board is about twenty-five feet in length and has four generator panels, one meter panel, two motor panels, two lighting panels, one alternating current break-down panel, a gauge panel, and two brackets for voltmeters. All necessary instruments, switches and circuit breakers are supplied. The meter panel may be

connected to any circuit and provides apparatus for the measurement of voltage, current, power and total energy. The lights of the building or any set of motors in the shops may be used as the load, or a water rheostat may be used independently. Each circuit is provided with a shunt, so that any meter may be connected across it, thus avoiding unnecessary duplication of instruments. The switchboard in the Electrical Laboratory is constructed on the plan of the old style series lighting boards, thus permitting the connections from any source of power to any table or class room. Three-wire, 220-110 volts, direct current, is supplied from the power plant of the Institute. Outside current, three-phase, 110 volts, is also connected to this board. A 2 k. w. rotary converter, operated as an inverted rotary, is so connected as to supply three-phase current, 60 cycles, when connected to the direct current supply. A 3 H. P. Wagner motor, 220 volts, is arranged to drive a 2 k. w. direct current generator, giving 110 volts. These two sets make the Electrical Laboratory practically free from interruption due to the failure of either the Institute plant or the outside supply. A motor-generator set transforms alternating current to 25 volts direct. A mercury arc rectifier transforms alternating current to about 90 volts direct. The storage battery contains 26 chloride accumulators, giving a maximum of about 52 volts, and any lower voltage desired. This battery supplies current for the fire alarm system, the program bells, and for the telephones, and is used for battery supply to all tables requiring low voltage or steady current. Apparatus is provided for tests for lamp resistance, candle power and efficiency, insulation resistance, line faults, permeability of iron and steel, transformer losses, instrument calibration, and other similar experiments. The newest and best methods of telegraph and telephone construction are presented, a new wireless telegraph of the Marconi type being part of the equipment.

The study of Chemistry is carried through one-half of the third year and through the fourth year, the regular high school course, with laboratory practice, continuing through

the first half of the fourth year. The latter half of the fourth year is devoted to qualitative analysis. The substances to be tested are graded, solutions being given at first, followed in logical order by soluble powders and insoluble solids. The laboratory tables are of a standard type, supplied with water, gas, and with waste connections. The table of each student is connected to an exhaust chamber for removing objectionable gases. The balances are located in a separate balance room, there being six of these instruments of different makes, all of good quality and high accuracy.

In the department of Engineering, the instruction given the fourth year students in theoretical and applied mechanics embraces the laws of equilibrium and of motion; center of gravity; friction; principles of work; moment of inertia; mechanics of materials; graphic methods of determining stresses in beams and in framed structures; and a study of the stresses and deformations produced in standard specimens of metal when subjected to tension, compression, and shearing. The work of the third and fourth year students in steam engineering consists of the study of the thermodynamics of the steam engine in a manner as comprehensive as their maturity permits. Numerous calculations are made involving engine and boiler efficiencies and proportions, and the study of the indicator is supplemented with practice in taking diagrams, from which the consumption and distribution of the steam and the power of the engine are determined. The advantages and disadvantages of the different kinds of steam engines and boilers are studied, particular attention being given to engine and boiler attachments and accessories. A study of valve motions with the aid of the Zeuner diagram, and a study of the important modern methods of governing engines, as well as a brief study of the steam turbine, are all included in the course.

The work of the fourth year in gas engineering consists of a study of the modern types of internal combustion engines. The methods of producing the fuels, of preparing and igniting the charge, and of governing the engine are studied in succession.

The work of the fourth year in mechanical laboratory practice consists of thirty-six comprehensive tests designed to supplement the class room work in engineering subjects.

The plant for all this work consists of a 100 k. w. turbo-generator, a 100 k. w. Corliss driven generator, a 100 k. w. generator driven by a Buckeye cross compound engine (in course of construction by the students), a 25 k. w. generator driven by a high-speed automatic cut-off engine (Harrisburg Standard), an inverted triple expansion marine engine of 100 I. H. P., an inverted compound marine engine of 60 I. H. P., a horizontal Atlas engine of 25 I. H. P., a 30 H. P. gasoline engine of the Autocar type, a 20 H. P. Otto gas engine and producer plant, two Keeler boilers of 175 H. P. each, and a Roberts safety water tube boiler capable of generating steam for the production of 120 I. H. P. when used in connection with the triple expansion engine. The compound and triple expansion engines may be worked singly or together in connection with a friction dynamometer specially designed at the Institute, an internal circulation of water in the brake wheel enabling the engines to run continuously in making power tests. Five of the engines were built by the students, including the two marine engines, which were designed at the Bureau of Steam Engineering of the Navy Department.

Grouped in the mechanical laboratory are all the engines, the gas producer plant, a steam-engine-driven air compressor, a steam pump, an air pump, two surface condensers, a water motor, a weir tank and well, weighing tanks, a measuring tank, a modern testing floor, a Riehle torsional testing machine capable of testing specimens up to five feet in length and of one and one-half inches in diameter, a Riehle oil testing machine capable of measuring friction to the extent of 500 pounds, and a Riehle testing machine for tension and compression of 50,000 pounds capacity. There are also steam, gas and coal calorimeters; apparatus for the thermal efficiency tests of steam traps, injectors and pumps; and apparatus for calibrating pressure gauges, thermometers, and

indicator springs. Exhaustive engine, boiler, compressor, and turbine tests for power and efficiency are made by squads of fifteen of the senior class, the results of which are recorded in standard forms and retained by the students.

In the mechanical drawing rooms are 280 tables of approved design, and an equipment of instruments and models well adapted to the requirements of an advanced course in the subject. Third year students are required to make a free-hand sketch of the parts of some machine, from which a finished drawing, tracing, and blue print are made. The work of the fourth year students in design tends to make them draftsmen in the true sense—not mere copyists.

The equipment in the machine, pattern, forge, sheet metal, and carpentry shops, is equal to that of any similar institution in the country.

THE COURSE OF INSTRUCTION IN DETAIL.

The course extends through a period of four years of 36 effective weeks of instruction each.

Students completing the full course of the Institute invariably obtain full sophomore standing, with some sophomore credits in the courses leading to the degrees of C. E., M. E. and E. E., at the leading technical universities of the country.

DEPARTMENT OF ENGINEERING AND APPLIED MECHANICS.

FIRST YEAR COURSE—D CLASS.

Mechanical Drawing.—36 weeks, 4 periods a week:

Use of instruments; lettering; elementary lessons.

Practice.—36 weeks, 4 periods a week:

(a) Carpentry; 18 weeks, 4 periods a week.

Lectures and exercises in laying out, cutting, framing, and joining wooden members.

(b) Sheet Metal; 18 weeks, 4 periods a week:

Lectures and exercises in soldering, and in sheet metal and venetian iron work.

SECOND YEAR COURSE—C CLASS.

Mechanical Drawing.—36 weeks, 4 periods a week:

Hatching; neatness and accuracy; scale drawing; intersection and development of surfaces.

Practice.—36 weeks, 4 periods a week:

(a) Carpentry; 5 weeks, 4 periods a week:

Review of the work of the first year.

(b) Pattern Making; 13 weeks, 4 periods a week:

Exercises in wood turning and in making simple patterns.

(c) Forge Work; 18 weeks, 4 periods a week:

Forging, welding, tempering and casehardening.

THIRD YEAR COURSE—B CLASS.

Steam Engineering.—36 weeks, 4 periods a week:

Types of boilers; boiler details; boiler room auxiliaries; the steam engine; engine details; indicating and governing; governors; valves; condensers; multiple expansion engines; theories of heat; thermodynamics; properties of perfect gases; properties of saturated steam; use of steam tables; combustion of fuel and steam generation; boiler and engine efficiencies; the engine mechanism; slide valve and link motion; duty and efficiency of pumps.

Mechanical Drawing.—36 weeks, 4 periods a week.

Detail drawings of machines from free-hand sketches; the working drawing, tracing, and blue print. Descriptive Geometry (see course in Mathematics).

Practice.—36 weeks, 4 periods a week.

(a) *Pattern Shop;* 18 weeks, 4 periods a week:

Exercises in making patterns for wrenches, pulleys, eccentrics, pillow-blocks, gears, globe valves, pipe joints, and core boxes where necessary. Lectures on construction and finish of patterns, on the different kinds of molding, and on the operation of the cupola.

(b) *Machine Shop;* 18 weeks, 4 periods a week:

Work on the lathe, planer, milling machine, drill-press, shaper and chipping and filing.

FOURTH YEAR COURSE—A CLASS.

The Steam Engine.—22 weeks, 3 periods a week:

The indicator and indicator diagram; measurement of power and of steam consumption; expansion of perfect gases and steam; the ideal and actual engine; engine and boiler design; valve diagrams; engine and boiler testing; the steam turbine.

The Internal Combustion Engine.—14 weeks, 3 periods a week:

Fuels, carburetors, vaporizers; ignition; cooling; lubrication; governing; indicator cards; efficiency; management; operation; defects and remedies; types of engines; gas producers.

Mechanics.—18 weeks, 5 periods a week:

Kinematics: Motion in a straight line with constant velocity and with constant acceleration; velocity and acceleration curves; vectors; resolution and composition of displacements, velocities, and accelerations; relative motion; acceleration with variation in direction of velocity; angular motion.

Dynamics: (a) Statics: The parallelogram, triangle, and polygon of forces; a composition and resolution of forces; friction; the inclined plane; the screw; parallel forces; moments of forces and

of couples; conditions of equilibrium; method of sections; equilibrium under the action of three forces; centre of gravity. (b) Kinetics: The laws of motion; inertia, mass, weight, momentum; work and power of a force and of a torque; potential and kinetic energy; principles of work; centrifugal and centripetal forces.

Mechanics of Materials.—18 weeks, 5 periods a week:

Stress, strain, elastic limit, ultimate strength; calculations involving bending and resisting moments, moment of inertia, radius of gyration, deflection and resilience of simple and cantilever beams and of columns and shafts; bending moment and shear diagrams.

Graphic methods of determining stresses in beams and framed structures by means of the funicular polygon and reciprocal diagram.

Mechanics of Machinery: Transmission of power by means of belts and toothed gears.

Mechanical Drawing and Design.—36 weeks, 4 periods a week:

Mechanical Drawing. The drafting accompanying the work in design; free-hand sketches, working drawings, tracings and blue prints.

Design: Proportioning of machine parts, such as spur, bevel, and worm gearing, belt pulleys, and bearings, from empirical and rational formulas. The application of the mechanics of materials to the design of some part of an engine or tool, such as a traveling crane, cylinder, connecting rod, valve, screw jack. The use of the Zeuner diagram in valve design. The application of graphic statics to the design of roof trusses and bridge members. Students are permitted to select a subject for design from a list of mechanical and electrical devices submitted to them.

Practice.—36 weeks, 4 periods a week:

(a) *Machine Shop;* 18 weeks, 4 periods a week:

Machine work involving accuracy and finish, such as gear cutting, building and assembling of machinery.

(b) *Engineering Laboratory;* 18 weeks, 4 periods a week:

Tension, compression, bending, torsion, and oil tests with Riehle machines; calibration of pressure gauges, thermometers, and indicator springs; practice with planimeters; calorimeter tests for quality of steam; calorific value of coal and of gas; valve setting; determining clearances; duty of steam pumps; indicated steam consumption of engines; economy tests of steam and gas engines, air compressor, boilers, producer plant, water motors, pumps, and steam traps.

DEPARTMENT OF MATHEMATICS.**FIRST YEAR COURSE—D CLASS.**

Algebra.—36 weeks, 4 periods a week:

Definitions and notation; fundamental operations; integral linear equations; factoring; highest common factor; least common multiple; fractions; fractional equations; simultaneous linear equations; graphical representation; inequalities; involution; evolution; theory of exponents; surds; quadratic equations.

Geometry.—36 weeks, 3 periods a week:

Geometry of the straight line and circle; proportion; properties of similar figures; original exercises.

Explanation and Demonstration.—36 weeks, 1 period a week:

The most difficult and important features of the course are explained and demonstrated.

SECOND YEAR COURSE—C CLASS.

Algebra.—36 weeks, 3 periods a week:

Review; theory of quadratic equations; variables and limits; indeterminate equations; ratio and proportion; logarithms; variation; arithmetical, geometrical, and harmonic progressions; binomial theorem; undetermined coefficients.

Geometry.—18 weeks, 3 periods a week, and 9 weeks, 4 periods a week:

Areas and volumes; lines and planes in space; polyhedrons; cylinder; cone; sphere; original exercises.

Trigonometry.—9 weeks, 4 periods a week:

Functions of the acute angle; the right triangle; use of tables; functions of any angle; relations between the functions of several angles; inverse trigonometric functions.

THIRD YEAR COURSE—B CLASS.

Trigonometry.—18 weeks, 3 periods a week:

General formulas; oblique triangle; miscellaneous examples.

Surveying.—18 weeks, 2 periods a week:

Instruments and their uses; land surveying.

Analytic Geometry.—36 weeks, 4 periods a week:

The straight line; circle; parabola; ellipse; hyperbola; transformation of co-ordinates; construction of loci; higher plane curves.

Descriptive Geometry.—Time taken from mechanical drawing, as it is taught in connection with that subject.

Projections; problems in straight line and plane; projections and sections of solids; curved surfaces and tangent planes; development and projection of screw thread; intersection of surfaces.

FOURTH YEAR COURSE—A CLASS.

Differential and Integral Calculus.—36 weeks, 5 periods a week:

Differentiation of algebraic and transcendental functions; successive differentiation; expansion of functions, including the development of Maclaurin's and of Taylor's theorems; evaluation of indeterminate forms; maxima and minima of functions of one variable, including geometric problems in maxima and minima; differentiation of functions of more than one variable; radius of curvature; tangents and normals; derivatives of arcs; fundamental rules and methods of integration; geometrical application of the calculus to lengths of curves, to areas, to volumes of solids of revolution; integration of trigonometric functions; successive integration; applications to mechanics.

DEPARTMENT OF SCIENCE.

SECOND YEAR COURSE—C CLASS.

General Physics.—36 weeks, 4 periods a week:

During this year the regular high school course in physics is given, omitting sound, light, and electricity, which are studied later in the course. Derivation of formulae and the solution of problems are required. Emphasis is laid upon such sections as have reference to engineering courses. Experimental demonstration by the instructor is made whenever the subject permits. Two periods a week are devoted to individual work in the laboratory during the last half of the year.

THIRD YEAR COURSE—B CLASS.

Electricity.—36 weeks, 3 periods a week:

Magnetism; galvanometers and other measuring instruments; laws of electrical action; magnetic and electrical units; simple alternating currents; derivation of formulae and practical problems; experimental demonstration by the instructor; individual laboratory work in electrical measurements.

General Physics.—18 weeks, 3 periods a week:

The work in physics is confined principally to advanced study of light and sound, the subjects of dynamics and heat being embraced in the work of the Department of Engineering.

Chemistry.—18 weeks, 3 periods a week:

Recitations in general chemistry with experimental work by the instructor, showing the preparation and reactions of the elements and compounds. Individual work in the laboratory.

FOURTH YEAR COURSE—A CLASS.

Electricity.—36 weeks, 4 periods a week:

Lectures and recitations in applied electricity, including electrochemical action; principles of the generator, motor, and transformer; railways; line and machine testing; telegraph and telephone; electric lighting. One period a week is devoted to individual laboratory work in measurements, practical testing, and the operation of the generator, motor, and transformer.

Chemistry.—36 weeks, 4 periods a week:

General Chemistry: This is a continuation of the work of the third year and is followed for the first half year, making a full year for general study of the subject. Several lessons in commercial chemistry and analysis are introduced, tending to illustrate the application of the theory to analysis of gases, manufacture of steel, etc.

Analytic Chemistry: A course in qualitative analysis of solutions and powders, the latter half of the fourth year being allotted to this work. Writing reactions and the significance of solubility and color are made prominent. Calculations depending upon chemical relations are especially emphasized.

DEPARTMENT OF ENGLISH AND GERMAN.

FIRST YEAR COURSE—D CLASS.

Composition and Rhetoric.—33 weeks, 2 periods a week:

Study of text and frequent written exercises based upon Narration and Description; letter writing.

Literature.—36 weeks, 3 periods a week:

(a) Study of the following selections: Sketch Book; Snow Bound, Tales of the White Hills; Poems and Tales from Poe; Sir Launfal; Lays of Ancient Rome; Lady of the Lake; Ivanhoe.

(b) Leading facts in the lives of the authors represented in (a).

German.—36 weeks, 4 periods a week:

Study of the grammar and reading.

SECOND YEAR COURSE—C CLASS.

Composition and Rhetoric.—36 weeks, 2 periods a week.

Frequent written exercises; study of rhetorical principles, with special emphasis upon exposition and argumentation.

Literature.—36 weeks, 2 periods a week:

(a) Study of the following selections: Ancient Mariner; Vicar of Wakefield; Deserted Village; Silas Marner; DeCoverley Papers; Merchant of Venice.

(b) Leading facts in the lives of the authors represented in (a).

German.—18 weeks, 4 periods a week; and 18 weeks, 3 periods a week:

Composition; grammar; reading standard German fiction and simple scientific prose.

THIRD YEAR COURSE—B CLASS.

Literature and Composition.—18 weeks, 2 periods a week; and 18 weeks, 3 periods a week.

Study of the following texts: Julius Caesar; Macbeth; Milton's L'Allegro, Il Penseroso, Lycidas, and Comus; Burke's Speech on Conciliation. Frequent written exercises.

German.—36 weeks, 3 periods a week:

Review of grammar and composition; copious reading in prose and poetry.

FOURTH YEAR COURSE—A CLASS.

Technical Composition.—36 weeks, 1 period a week.

Methods of exposition, and drill in the non-technical discussion of subjects taken from the students' work in the technical departments. Frequent conferences with instructors.

DEPARTMENT OF HISTORY AND CIVICS.**FIRST YEAR COURSE—D CLASS.**

History.—36 weeks, 5 periods a week:

English History from its beginning to the present day. Especial attention is given to the social, economic, and political phases of the subject; and as far as time and maturity of the pupils permit, attention is directed to the development of Europe as it progressed contemporaneously with England.

SECOND YEAR COURSE—C CLASS.

History and Civics.—36 weeks, 4 periods a week:

American History, with special attention to political development; civil government of the United States and the rights and duties of American citizenship.

TIME DEVOTED TO THE DIFFERENT SUBJECTS COMPRISING THE FOUR YEAR COURSE.

	NUMBER OF HOURS PER YEAR.				
	1st Year	2nd Year	3rd Year	4th Year	Aggregate
DEPARTMENT OF ENGINEERING					
Carpentry	72	20	.....	.....	92
Sheet Metal	72	.....	.....	.....	72
Vise .....	.....	36	.....	.....	36
Forge .....	.....	36	24	.....	60
Pattern .....	.....	52	72	.....	124
Machine .....	.....	.....	48	72	120
Mechanical Laboratory .....	.....	.....	.....	72	72
Mechanical Drawing	144	144	108	.....	396
Descriptive Geometry .....	.....	.....	36	.....	36
Machine Design .....	.....	.....	.....	144	144
Steam and Gas Engines.....	.....	.....	144	108	252
Mechanics .....	.....	.....	.....	90	90
Mechanics of Materials.....	.....	.....	.....	90	90
DEPARTMENT OF MATHEMATICS					
Algebra	144	108	.....	.....	252
Geometry	108	90	.....	.....	198
Geometry, Analytic .....	.....	.....	144	.....	144
Trigonometry .....	.....	36	54	.....	90
Surveying .....	.....	.....	36	.....	36
Calculus, Differential .....	.....	.....	.....	90	90
Calculus, Integral .....	.....	.....	.....	90	90
Explanation and Demonstration...	36	.....	.....	.....	36
DEPARTMENT OF SCIENCE					
Physics .....	.....	108	36	.....	144
Physics, Laboratory .....	.....	36	18	.....	54
Electricity .....	.....	.....	72	108	180
Electricity, Laboratory .....	.....	.....	36	36	72
Chemistry, General .....	.....	.....	36	54	90
Chemistry, Laboratory .....	.....	.....	18	18	36
Chemistry, Analytic .....	.....	.....	.....	72	72
DEPARTMENT OF ENGLISH					
Composition and Rhetoric	72	72	.....	.....	144
Literature	108	72	90	.....	270
German	144	126	108	.....	378
Technical Composition .....	.....	.....	.....	36	36
DEPARTMENT OF HISTORY AND CIVICS					
History	180	.....	.....	.....	180
History and Civics .....	.....	144	.....	.....	144
Total	1080	1080	1080	1080	4320

REQUIREMENTS FOR ADMISSION.

Pupils bearing properly attested certificates of having passed the prescribed Elementary School Course of the Public School System of Baltimore are entitled to enrollment.

Other applicants residing in the city will be admitted after passing an examination covering the requirements of the eighth grade. Eighth grade pupils who fail of promotion are not eligible for admission under this requirement. Specimen entrance examination papers covering the requirements of the eighth grade will be found on pages 44, 45 and 46.

After having successfully passed the entrance examination, a non-resident applicant must register as such at the office of the Secretary of the Board of School Commissioners, where he will be furnished with a bill for the first quarterly installment of the annual fee of \$85, and a presentation at the Institute of a coupon from the bill, signed by the City Comptroller, will be accepted as evidence of payment, and entitle the applicant to enrollment.

MERIT ROLLS.

Merit rolls, showing the proficiency of students in each branch of study, are made out annually for the different classes.

Each subject is assigned a coefficient indicative of its relative weight, and the final mark of a student in a subject (on a scale of 100) is multiplied by its coefficient. The sum of the products thus obtained is the final mark of the student in all the subjects for the year. This mark is a certain percentage of the sum of the coefficients, and such percentage is the student's average for the year.

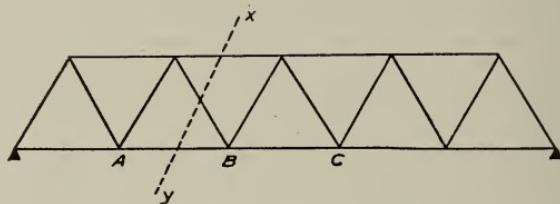
SOME RECENT EXAMINATION PAPERS.**MECHANICS.**

FOURTH YEAR CLASS—January 22, 1913.

1. A stone is projected vertically upward with a velocity of 240 feet per second. How many feet will it pass over during the fourth second of its upward flight? At what altitude will it be at the end of the sixth second, and also at the end of the seventh?
2. Two ships leave a port at the same time, the first steams northwest at 12 miles per hour, and the second 30° south of west at 15 miles per hour. What is the speed of the second relative to the first? After what time will they be 100 miles apart, and in what direction will the second lie from the first?
3. A bullet weighing 1 oz. enters a block of wood with a velocity of 2,000 feet per second, and penetrates it to a depth of 6 inches. What is the average resistance of the wood to the bullet?
4. A locomotive draws a train weighing 200 tons along a level track at 30 miles per hour, the resistance amounting to 30 lbs. per ton. What horse-power is it exerting? Find also the horse-power necessary to draw the train at the same speed: (a) up an incline of 1 in 100, (b) down an incline of 1 in 100.
5. A cannon weighing 50 tons projects a shot weighing 2,000 lbs. with a velocity of 1,500 ft. per second. With what initial velocity will the cannon recoil? What average force will be required to bring it to rest in $2\frac{1}{2}$ feet.
6. How long will it take a car weighing 10 tons to accelerate from 10 miles per hour to 15 miles per hour against a resistance of 25 lbs. per ton, if the motors exert a uniform tractive force on the wheels and the horse-power is 25 at the beginning of this period?
7. A wheel has five equally spaced spokes, all in tension. If the tension of three consecutive spokes are 1,000 lbs., 1,500 lbs. and 2,000 lbs., respectively, find the tensions in the other two.
8. With a coefficient of friction of 0.15, what must be the inclination of a plane to the horizontal if the work done by the minimum force in dragging 50 lbs. a vertical distance of 5 feet up the plane is 400 foot lbs.?

9. Four forces of 6, 9, 4 and 5 lbs. act along the respective directions AB, BC, DC and AD of a square ABCD. Two other forces act one in CA and the other through D. Find their amounts if the six forces keep the body in equilibrium.

10. The jointed structure given below is built up of bars all of equal length, and carries loads of 10, 12 and 18 tons at A, B and C., respectively. Find by the method of sections the stress in each of the members cut by the section xy.



MECHANICS OF MATERIALS.

FOURTH YEAR CLASS—May 21, 1913.

1. Find the moment of inertia and radius of gyration of a trapezoid about an axis coinciding with the larger base.

2. A beam 28 feet long weighing 1,000 lbs. per foot overhangs the left support 5 ft. and the right support 3 ft. It bears concentrated loads of 1,000 lbs. and 4,000 lbs. at points 10 ft. and 21 ft. respectively from the left support. Construct the bending moment diagram. Linear scale, 1"=8'; bending moment scale, 1"=1,000 lbs. ft.

3. Construct the shear diagram for the beam of problem 2. Load scale, 1"=3,000 lbs.

4. It is desired to place an I beam across an opening of 18 feet in a building. The beam is to sustain a concentrated load of 400 lbs. at a point 7 ft. from the left end and a uniformly distributed load including the weight of the beam of 200 lbs. per foot. Select a Cambria I beam for this case.

5. A continuous beam resting on three supports equally spaced and on the same level is uniformly loaded.

Find: (a) The support reactions.

(b) An expression for the deflection at any section.

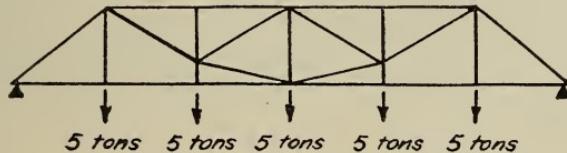
6. A hollow cylindrical cast iron column with square ends is 18 ft. long and has an outside diameter of 15 inches. Determine the inside diameter in order that it may safely bear a load of 300,000 lbs.

7. Find the width and thickness of the belt necessary to transmit 15 H. P. to a pulley 18" in diameter so that the greatest tension may not exceed 50 lbs. per inch of width when the pulley makes 400 r. p. m. The weight of the belt per square foot is 1.44 lbs. The coefficient of friction is 0.28, and the arc of contract is 165° . The weight of 1 cu. in. of leather may be taken as 0.036 lb.

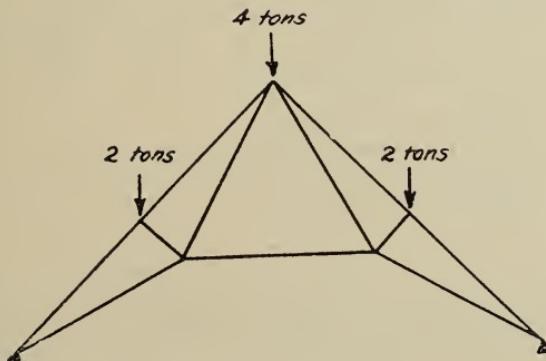
GRAPHIC STATICS.

8. A beam 28 ft. long weighing 100 lbs. per foot overhangs the left support 5 ft. and the right support 3 ft. It bears concentrated loads of 1,000 lbs. and 4,000 lbs. at points 10 ft. and 21 ft., respectively, from the left support. Construct the funicular polygon. What is the maximum bending moment? Locate the points in inflection if there are any. Linear scale, 1"=8'; load scale, 1"=2,000 lbs.; polar distance, 0.75".

9. Determine the stress in each member of the Greiner Truss. Load scale, 1"=5 tons.



10. The roof truss shown below has a span of 50 ft., the left end of the truss is free and the right end fixed. Normal wind pressure, 33 lbs. per sq. ft. of roof surface; distance between trusses, 14 ft. Consider the wind blowing on the left side of roof. Find the stress in each member of the truss. Linear scale, 1"=10 ft.; load scale, 1"=4 tons.



STEAM ENGINEERING.

THIRD YEAR CLASS—June 6, 1913.

1. A vessel of 75 cu. ft. capacity contains air at a pressure of 150 lbs. per sq. in. Find the weight of the air in the vessel.

2. The following results were obtained from an efficiency test of an engine and boiler :

I. H. P. of engine.....	120
B. H. P. of engine.....	100
Steam used per hour.....	2,200 lbs.
Gauge pressure of steam.....	.99.3 lbs.
Temperature of steam.....	337.4° F.
Superheat of steam.....	50° F.
Coal used per hour.....	240 lbs.

Total heat lost in chimney gases per lb. of coal, 3,000 B. T. U.

The coal used contained 90%C., 2%H., 7%O., and 0.8%S. 20 lbs. of air were used in burning one lb. of coal. The temperature of the air supply was 57° F., and of the chimney gases, 620° F. The specific heat of N. is 0.244; of O, 0.218; of CO₂, 0.217; of H₂O, 4.42, and SO₂, 0.17.

Find temperature of furnace.

3. From the data of problem 2 find :

- a. Mechanical efficiency of engine.
- b. Thermal efficiency of engine.
- c. Thermal efficiency of engine and boiler.
- d. Boiler horse-power.

4. From the data of problem 2 find :

- a. Efficiency of combustion.
- b. Efficiency of heating surface.
- c. Efficiency of boiler.
- d. Efficiency of System.

5. A triple expansion engine, having cylinders of 12", 17" and 22" diameter, and 10" stroke, has 0.5 cut-off in the high pressure cylinder and 6.5% clearance in each cylinder. Find the ratio of expansion. If the initial pressure is 200 lbs. per sq. in., find the terminal pressure.

6. During a boiler test in the Mechanical Laboratory of the Baltimore Polytechnic Institute the following was obtained with a barrel calorimeter:

160 lbs. of water at 65° F. in barrel before test.

10 lbs. of steam at 358° F. were blown into water in barrel.

120° F. temperature of mixture.

Find the dryness of the steam.

STEAM ENGINEERING.

FOURTH YEAR CLASS—June 11, 1913.

1. A boiler evaporates 9 pounds of water per pound of coal into steam of 185 pounds pressure per gauge from a feed water temperature of 152 degrees, the steam containing 3% of moisture. The coal contains 12% of ash and 4% of moisture. Find the actual evaporation and equivalent evaporation from and at 212 degrees per pound of dry combustible.

2. Required the cylinder dimensions of a compound engine to develop 2,200 I. H. P. while working under the following conditions: piston speed, 750 feet per min.; initial absolute pressure, 112 pounds per square inch; absolute back pressure, 2 pounds; cut-off in high-pressure cylinder, 0.4 of stroke; clearance in high-pressure cylinder, 12 per cent.; clearance in low pressure cylinder, 10 per cent. Assume a cylinder ratio of 3.25 and a mean pressure factor of 0.8.

3. Stroke, 8 inches; steam lap, $\frac{5}{8}$ inch; maximum port opening to steam $\frac{9}{16}$ inch; exhaust lap, $\frac{1}{8}$ inch; release, 90 per cent. of stroke; connecting rod length, 15 inches. Find by means of the Zeuner diagram: travel of valve; angular advance; lead and cut off in per cent. of stroke.

4. Stroke, 15 inches; clearance, $6\frac{2}{3}$ per cent. of stroke; cut-off, 0.2 stroke; pressure at cut-off, 76 pounds absolute. Plot the curves for hyperbolic and saturated steam expansion, finding points on the curve when r equals 2, 3 and 4. Lineal scale, $3''=1'$; pressure scale, $1''=40$ lbs.

5. Stroke of engine, 24 inches; clearance, 6 per cent. of stroke; cut-off, $\frac{3}{8}$ of stroke; ratio of compression, 3; initial absolute pressure, 85 pounds; absolute back pressure, 18 pounds. Using the properties of the indicator diagram for preliminary engine design, find the mean effective pressure.

6. Using the data of problem number 5, determine the indicated steam consumption per indicated horse-power per hour.

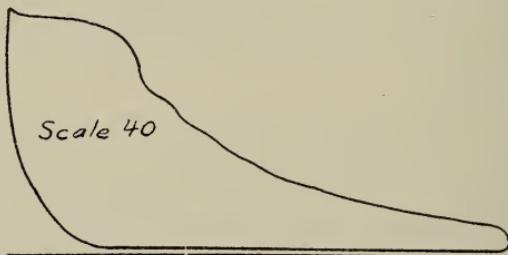
STEAM AND GAS ENGINEERING.

FOURTH YEAR CLASS—May 16, 1913.

1. A Scotch boiler is to be designed to withstand a steam pressure of 250 lbs. per square inch and to have a diameter of 15'. The flat top of the combustion chamber is to have an area of 32" x 48" and is to be braced with girder stays $\frac{7}{8}$ " in thickness. The stay bolts are to be pitched at 6", the tensile strength of the steel used is to be 65,000 lbs. per square inch, and its factor of safety, 4.

Find (a) The depth of the girder stays; (b) diameter of the stay bolts; (c) thickness of the boiler shell.

2.



The above indicator card was taken from an engine having a clearance space of 5% of the stroke volume. Taking a point on the expansion curve at 65 lbs. absolute pressure and one on the compression curve at 22 lbs. absolute pressure, compute the indicated steam consumption per I. H. P. per hour.

Sketch the cylinder, piston and arrangement of the pumps of the Koerting, two cycle, double acting, gas engine. Supplement your sketch with an explanation of their functions during one cycle.

Sketch a reversing gear for a marine gas engine. Describe its operation.

Draw indicator cards which illustrate the following: Throttling the normal charge; retarding the ignition; too early ignition; faulty exhaust.

State the cause of and remedy for the following faults: Knocking, crank chamber explosions, smoky exhaust, loss of compression, premature ignition.

Sketch a Schebler carbureter. Describe its operation.

MECHANICAL LABORATORY PRACTICE.

FOURTH YEAR CLASS—May 29, 1913.

1. Describe the process of making wrought iron. What is the effect of sulphur and of phosphorous on wrought iron? State the uses of wrought iron in engineering.
2. Describe Nickel Steel. Describe Tungsten Steel. What materials and what proportions of each are used in making semi-steel?
3. Define stress and strain. Describe the method of conducting a tension test on a specimen of wrought iron.
4. Derive a formula for use with the throttling calorimeter. Boiler pressure per gauge, 152.5 lbs., barometer pressure, 20.62 inches of mercury, pressure in the calorimeter, 3 lbs. per gauge, temperature of steam in calorimeter by thermometer, 300 degrees F. Find the dryness fraction.
5. Sketch the Mahler Bomb Calorimeter and describe its action.
6. In a test made with a Junker Gas Calorimeter, the following data were obtained:

Inlet temperature, 66.5° F.; outlet temperature, 104.03° F.; temperature of gas, 85° F.; barometer, 29.8 inches of mercury; pressure of gas in pressure regulator, 0.0132 inches of mercury, and its vapor tension at 85° temperature is 1.209 inches of mercury. During the test 4.68 lbs. of water were heated by the use of 0.3 cu. ft. of gas, and 0.011 lbs. of water of combustion was trapped at a temperature of 50° F. Find: (a) Upper heating value, (b) lower heating value, (c) normal heating value.

DIFFERENTIAL CALCULUS.

FOURTH YEAR CLASS—June, 1909.

1. Define increment and derivative. Illustrate by finding the derivative of the function $y = \sqrt{a^2 - x^2}$.

$$2. \text{ Find } \frac{dy}{dx} \text{ when } x = a \log \frac{y + \sqrt{y+a}}{\sqrt{a}}$$

3. What is the area of an equilateral triangle at the moment its side is increasing at the rate of 10 feet per minute and its area at the rate of 10 square feet per second?

$\frac{dy}{dx}$

4. Find $\frac{dy}{dx}$ from $y = (x^2+1) \sqrt{x^3-x}$.

5. Find $\frac{dy}{d\theta}$ from $y = \log \frac{\sin^{1/2}(\theta-a)}{\sin^{1/2}(\theta+a)}$

 $\frac{d^3y}{dx^3}$

6. Find $\frac{d^3y}{dx^3}$ from $y = (\sin x - \cos x) x e^x + 3e^x \cos x$.

$$\frac{\log(x^2-4x+5)}{\log \cos(x-2)}$$

7. Determine the limiting value of $\frac{\log(x^2-4x+5)}{\log \cos(x-2)}$ when $x = 2$.

8. Find the tangent of 44° , using Taylor's Theorem.

9. A weight of 1,000 pounds hanging two feet from the fulcrum end of a lever is to be raised by an upward force at the other end. Supposing the lever to weigh 10 pounds per foot, find its length that the force may be a minimum.

10. Find the equations of the two tangents to the circle $x^2+y^2-3y=14$, parallel to the line $7y=4x+6$.

11. Change the independent variable from x to z in the following:

$$\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} + y = 0, \text{ when } x^2 = 4z.$$

Omit any one except 4 or 9.

INTEGRAL CALCULUS.

FOURTH YEAR CLASS—June, 1913.

1. Show that the area of the triangle intercepted between a tangent to the curve $2xy=a^2$ and the axes is constant and equal to $2a$.

2. Show that the curves $y^2=ax$ and $2x^2+y^2=b^2$ meet at right angles.

$y \quad z \quad x$

3. Given $u = \frac{y}{z} + \frac{z}{x} + \frac{x}{y}$. Prove that x multiplied by the partial

derivative of u with regard to x , plus y multiplied by the partial derivative of u with regard to y , plus z multiplied by the partial derivative of u with regard to z is equal to zero.

4. Find the asymptotes of the curve $(x-2a)$ $y^2=x^3-a^3$.

5. Find the volume generated by revolving $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the axis OY.

$$6. \int \frac{x^4 dx}{x^2 - 3x + 2} = ?$$

$$7. \int \frac{\log x dx}{\sqrt{3x-2}} = ?$$

$$8. \int \sin^2 x \cos^2 x dx = ?$$

$$9. \int x^2 \log x dx = ?$$

10. Find the area of one arch of the curve $y = \sin \frac{1}{2}x$.

ANALYTIC GEOMETRY.

THIRD YEAR CLASS—June, 1909.

1. Find the equation of the ellipse, having given the foci and the constant sum $2a$.
2. The equation of an ellipse is $25x^2+81y^2=450x$ when referred to rectangular axes. Find the major and minor axes and the co-ordinates of the centre.
3. Tangents are drawn from $(3,2)$ to the ellipse $x^2+y^2=4$. Find the equation of the chord of contact, and of the line that joins $(3,2)$ to the mid-point of the chord.
4. Find the equations of the tangent and the normal to the hyperbola at the point (x_2, y_2) on the curve.
5. Write the equation of the hyperbola conjugate to $9x^2-16y^2=144$, and find its axes, distance between its foci, and its latus rectum.
6. Find the length of the semi-diameter conjugate to the diameter $y=3x$ in the hyperbola $9x^2-4y^2=36$.
7. Define the Conchoid of Nicomedes. Develop its equation and discuss it.
8. Plot the curve whose equation is $r=a(1-\cos\theta)$.

SURVEYING.

THIRD YEAR CLASS—June 12, 1908.

1. Show, by a drawing, a vernier reading 7.563.
2. From the following field notes, plot the field and calculate its area :
 1. N. $73^{\circ} 30'$ W. 5.00 chains.
 2. S. $16^{\circ} 30'$ W. 5.00 chains.
 3. N. $28^{\circ} 30'$ W. 7.07 chains.
 4. N. $20^{\circ} 00'$ E. 11.18 chains.
 5. S. $43^{\circ} 30'$ E. 5.00 chains.
 6. S. $13^{\circ} 30'$ E. 10.00 chains.
3. In the triangle ABC, AB=12 chains, AC=10 chains, and BC=8 chains; part off a trapezoid of 1 acre 96 perches by the line DE parallel to AB.
4. Write the proper numbers in the third and fifth columns in this scheme, make a profile of the section, and determine the gradient per station :

Station	+S	H.I.	-S	H.S.	Remarks.
	6.944				Bench on post
0			7.4		22 feet north
1			3.9		of O.
2			5.6		
3			4.6		
t. p.	3.855		5.513		
4			4.9		
5			3.5		
6			1.2		

ANNUAL EXAMINATION IN CHEMISTRY.

FOURTH YEAR CLASS—May 28, 1915.

1. Define the terms precipitate, filtrate, reagent. Name the solvents for lead carbonate, lead sulphate, mercuric sulphide, and barium sulphate.
2. Arrange a table for the separation of the commoner metals into five groups, giving the color of the precipitate and the reagents used.

3. A powder consists of the sulphates of silver, magnesium and iron (ferrous). Give complete directions for the separation of the bases, including reactions wherever a precipitate is formed.

4. A solution contains manganese chloride and zinc sulphate. Give complete directions for the detection of the bases and acids.

5. A powder contains the chlorides of ammonium, sodium and potassium. Give complete directions for their separation.

6. In making tests for acids, why is the powder first boiled with sodium carbonate? If a precipitate is formed during the boiling, what would it indicate?

7. Give the tests for nitrates, bromides, iodides, acetates, phosphates, carbonates and sulphides.

8. Give the flame tests for calcium, barium, strontium, sodium, potassium, copper, and boric acid. Name the colors of the borax beads produced in the oxidizing flame by chromium, copper, cobalt, iron, manganese, and nickel. How may ferrous and ferric irons be distinguished?

9. A powder contains mercurous nitrate, bismuth carbonate, ferrous sulphate, barium chloride, and sodium acetate. Give directions for dissolving the powder, noting the solubility of each of the constituents and any probable reactions that would take place.

ANNUAL EXAMINATION IN ELECTRICITY.

FOURTH YEAR CLASS—May 26, 1915.

1. Calculate the electromotive force of a three-phase generator, delta connected, having 960 conductors per phase, wound in three sections, the constant of this winding being 0.96. The speed of the revolving field is 94 r. p. m. and there are 32 poles, each having a flux of 21,500,000 maxwells.

2. Discuss the merits of the revolving field and the revolving armature for alternating current generators. Make a diagram for synchronizing with a lamp, showing transformers, bus bars, and generators.

3. A balanced three-phase circuit gives the following indications: 11,000 volts, 435 amperes, 90 per cent. power factor. What power is being delivered to the line? What would be the full load current carried by a 20 horse-power motor, 220 volts, efficiency 85 per cent., power factor 92 per cent?

4. Make diagram for three transformers, showing the primaries star-connected and the secondaries delta-connected. Also show how two transformers may be used for transforming two-phase to three-phase, giving the relative voltage of the coils.

5. A transformer test gives the following data: Core loss, 200 watts; copper loss, 90 watts, the secondary current being 30 amperes; secondary voltage, 220. Calculate the efficiency of the transformer when the output is 4 kilowatts. What will be the secondary current when the transformer is operating at maximum efficiency? What will be the maximum efficiency of this transformer?

ENGLISH.

THIRD YEAR CLASS—June, 1914.

1. Define and illustrate the various sorts of inductive and deductive arguments.

2. Trace the thread of the argument in Burke's speech on "Conciliation."

3. Quote at least three of Burke's apothegms. Select one, and show its application to some political or social condition.

4. Draw a brief upon either side of the following proposition, and write out in full the body of the argument: Resolved, That amateur baseball should be permissible in Baltimore City between the hours of 2 and 7 P. M. on Sundays from May 1 to September 30.

5. (a) Write to Senator William J. Ogden, Law Building, Baltimore, asking for appointment to one of the technical scholarships in the Johns Hopkins University.

(b) Write Senator Ogden's reply, which says that he intends to hold a competitive examination open to the boys of your district, and invites you to compete.

(c) Assuming that you have won the scholarship, write Senator Ogden a note expressing your appreciation of his method of making the appointment.

ENGLISH.

FOURTH YEAR CLASS—June, 1914.

(Omit 2 or 3.)

1. Write for an intelligent but non-technical group of readers an explanation of the value of the indicator diagram in engineering.

2. Describe the Corliss type of steam engine (use sketches freely).

3. Explain the physics of the heavier-than-air flying machine.

4. Point out the further needs of the Polytechnic Institute as you see them.

5. What changes in the course in English given to your class would in your judgment have made the work in that subject more beneficial?

GERMAN.

THIRD YEAR CLASS—June, 1914.

1. (a) Translate "Hermann und Dorothea," Canto I, ll. 110-150
[Texts to be supplied in the examination room.]

1. (b) Mit diesem Namen bezeichnet man die Feuchtigkeit, welche wir abends oder in der Nacht auf Gras, Blättern, Steinen, ja manchmal auf unserm Haar erscheinen sehen. Des Morgens haben wir schon auf die Tautropfen bemerkt, welche auf den Grashalmen und den Sommerfäden glitzern. Diese Feuchtigkeit kommt aber nicht aus den Blättern oder Steinen, noch aus unserm Haar. Sie kommt Verdichtung aus der Luft, genau so, wie wir auf dem kalten Glase, welches in die warme, feuchte Luft eines Zimmers gebracht wurde, das Nebelhäutchen entstehen sahen. Das Nebelhäutchen war eigentlich Tau, denn aller Tau entsteht auf dieselbe Weise und aus denselben Ursachen.

In der Nacht, wenn der Himmel klar ist, strahlt die Erde sehr viel Wärme aus; d. h. sie giebt dem kalten Luftraum einen großen Teil der Wärme, welche sie während des Tages von der Sonne empfangen hat. Ihre Oberfläche wird infolge dessen kalt, wie wir nach Einbruch der Nacht an Steinen und Blättern fühlen können. Die dem kalten Boden zunächst liegende Luft wird unter ihren Verdichtungspunkt abgetaut und der Überfluss an Dampf wird als Tau auf Gräser, Blätter, Zweige, Steine und andere Gegenstände abgelagert. Die Temperatur, bei welcher diese Verdichtung zu entstehen beginnt, nennt man den Taupunkt.

2. Es war einmal vor langen Jahren ein armer Mann, der hatte sein Häuschen in einem dichten Walde, darin wohnte er mit seiner Frau und sechs Kindern, und das waren alle Knabne. Obwohl das Häuschen klein und schlecht war, so hatten sie doch genug zu essen, und froh und zufrieden waren sie auch. Sie waren glücklich. Mehr hat auch ein Kaiser nicht, und mancher König hat nicht so viel.

Der jüngste von den Knaben war bloß zwei Jahre alt, aber er war größer und stärker als sein Bruder, der doppelt so alt war. Er hatte auch Haare so hell wie Gold und Sonnenschein. Datum hieß ihn der Vater nur „Goldener.“

Eines Tages ging der Vater in den Wald, um Holz zu hauen. Da rief der Jüngste: „Vater, ich gehe mit, ich will dir helfen,“ und lief ihm nach. „Gut,“ sagte der Vater, „komm nur, kleines Männchen.“ Da nahm ihn der Vater bei der Hand, und sie gingen zusammen in den Wald hinein.

3. Write in columns the Infinitive, Past, and Past Participle of: war; hatte; lief; sagte; and komm.

4. Write in columns the following nouns, give the case, and reason for such for each: Jahren; Walde; Frau; Bruder; Hand.

5. Name the Word Order of each of the four clauses in the first sentence above.

SPECIMEN ENTRANCE EXAMINATION PAPERS.

**Set for Pupils Other Than Those Promoted From
the Elementary Schools.**

SPELLING AND PENMANSHIP.

Writing from dictation a paragraph or two of some standard text—
Irving's Rip Van Winkle or Bancroft's United States History.

GRAMMAR.

- I. Use each part of speech in a different sentence, indicating the part of speech used in each sentence by underscoring and naming it.
- II. Define and give an example of a simple sentence, of a complex sentence, and of a compound sentence.
- III. Parse the italicized words in the following sentence: "By not heading the *councils* of our elders, *how* often do we *lose what* we should gain!"
- IV. Analyze the following sentence: "If we send the sailors a message in time, they will help us when the savages attack."
- V. Write sentences illustrating the correct use of any perfect tense of each of the following verbs: sit, set, seat, lie, lay, write, go.

COMPOSITION.

The subject set is a description of some well-known place or object or an account of some historical event.

AMERICAN HISTORY.

1. What parts of the American continent were explored or settled in early Colonial times by each of the following nations?

- (a) Spanish.
- (b) French.
- (c) English.
- (d) Dutch.
- (e) Swedes.

2. Mention two explorers who were prominent in the service of the Spanish; two who were prominent in the service of the French; two who were prominent in the service of the English.
3. Write a short account of the early history of the colony of Maryland.
4. Write a short account of the settlement of Virginia.
5. (a) What were indentured servants?
(b) For what was William Penn noted?
(c) For what was Roger Williams noted?
6. (a) Tell the story of Braddock's defeat.
(b) Tell the story of General Wolfe's capture of Quebec.
(c) What terms of peace were made between the French and the English by the Treaty of Paris in 1763?
7. (a) Mention three causes of the American Revolution.
(b) Mention two prominent British generals, and two prominent American generals who served in the Revolution.
(c) Give a brief account of the Battle of Long Island, explaining the object of each commander and the result of the battle.
8. (a) Tell the story of the Louisiana Purchase.
(b) Tell the story of the Lewis and Clark Expedition.
9. What were the causes of the Mexican war? Mention two leading American generals, and state briefly what each accomplished.
10. Tell briefly for what each of the following was noted:
 - (a) Thomas Jefferson.
 - (b) Henry Clay.
 - (c) Andrew Jackson.
 - (d) Daniel Webster.
 - (e) Abraham Lincoln.

ARITHMETIC.

1. Divide 5.375 by 0.0125, obtaining the exact results.

$$1 + 0.5 \quad 0.05 \div 0.005 \quad 0.4\frac{1}{2}$$

- .2 Simplify $\frac{1 + 0.5}{1 - 0.5} \times \frac{0.05 \div 0.005}{0.22 \frac{2}{9}}$

3. A merchant's sales on Monday amounted to \$385.84. His sales on Monday were $16 \frac{2}{3}\%$ of 54% less than the amount of goods sold on Tuesday. What was the amount of Tuesday's sales?
4. A firm sold an engine for \$7,050, thereby losing 6%; for what should it have been sold in order to gain 12%?

ALGEBRA.

1. Factor the expressions: $a^2 + 6ax + 5x^2$, $n^{10} - 16n^5 - 80$, and $1 - 9x - 36x^2$.

2. Simplify $\left[(a^2 - x^2) \div \left(\frac{1}{x} - \frac{1}{a} \right) \right] - \left[(a^2 - x^2) \div \left(\frac{1}{x} + \frac{1}{a} \right) \right]$

3. Given $\frac{2x+1}{5} - \frac{3y+2}{7} = 2y - x$, $\frac{3x-1}{4} + \frac{7y+2}{6} = 2x - y$, find

the value of x and y .

CATALOGUE OF STUDENTS.

Students whose names are marked with an asterisk (*) received 85% or more of the possible multiple for the year.

MID-YEAR CLASS OF 1916—34 MEMBERS

Adams, Arthur J.	McGinnis, Herbert B.
Baer, Bankard F.	Moltz, Leonard C.
Bishop, Russell G.	Neal, R. Wernom
Currie, Kent D.	O'Keefe, John J.
*Dehler, Frank C.	*Pearson, William P.
Erck, Henry G.	Price, Alan Davis
Esterson, Max	Rhode, Russell M.
Finkelstein, Isidore	*Schimmel, Richard
Gier, C. Frank, Jr.	Sellman, L. Willson
Goldstein, David	Slasman, William Howry
*Greenspun, Joseph	Stewart, William L.
Haile, LeRoy Y.	Stumptner, Albert G.
Hollstein, Arthur W.	Talbot, George G.
Kalling, Lewis J.	Townsend, F. Howard
*Keese, Maurice J.	Walter, Jasper F.
Lutzky, Bernard	Weinberg, Samuel L.
McDonald, George R.	Wherley, Clarence V.

CLASS OF 1916—114 MEMBERS.

("A" Class.)

Alvey, C. Walter	Bowen, J. Wesley, Jr.
Anger, E. Albert	Broadbelt, J. Edward, Jr.
Applestein, Frank	Burner, Russell K.
Baker, Eli	Calder, A. King
Baker, Harold D.	Cassard, Louis L.
Bauer, Charles M.	Clark, M. DeKalb
Bentz, W. Leonard	Codd, William V.
Berlin Max	Cook, William Dodd
*Berry, T. Morris	Countess, J. Edgar, Jr.
Betz, Norman J.	Crout, Marvin M.
Black, Frank E.	Culler, R. Lester
Bloomsburg, Harry E.	Davis, Curtis F.
Bolte, John Kirk	Doyle, S. Bernard

- Dreyer, C. Frederick
Erdman, Francis W.
Faupel, Stanley H.
Fekl, Charles J.
Field, Samuel S., Jr.
Fitzpatrick, Charles M.
Foreman, Carroll L.
Fulton, Franklin D.
Garrett, Wilmer F.
Gompf, George E.
Hall, Robert S.
Hambleton, Richard W.
Hampson, George M.
Hedrick, Melvin D.
Hess, Leslie H.
Holmes, Richmond B.
*Hubbard, Thomas F.
Hunt, John J.
Ingham, W. Chesney
Jennings, J. Carey
Jackson, Arthur L., Jr.
James, John A.
Jasper, Felix
Johnson, Edward C.
Johnson, Louis B.
Kairys, Harry
Kellner, Raymond C.
Kidd, William C., Jr.
Knecht, Andrew H.
Knipp, Howard F.
Lamb, Roland H.
Lauten, William B.
Lentz, Valentine W.
Lipschutz, Louis
*McShane, Ralph E.
Merriken, William Lee
Miller, Harold F.
Miller, William R.
Mohlhenrich, Henry C.
*Mullan, Evans A.
Nunn, Edward H.
Orne, Stephen W.
Paige, Edmund R.
Parsons, Albert B.
Plaskitt, James M.
Platt, Louis
Poehlman, G. Irvin
Pohmer, Albert E.
*Rice, Emory C.
Rinn, Henry F.
Roebuck, T. Harry
Rosenblatt, Samuel
Rosenfeld, Benjamin
Roskes, David S.
*Salter, Ernest H.
Schiaffino, Aurelio T.
Sebald, John L.
*Senner, Arthur H.
*Shamberger, S. Joseph
*Shpritz, Nathan
Silberstein, Samuel
Sinclair, Walter P.
Smith, William A., Jr.
Sonneborn, David B.
Strasser, Edward F.
Taylor, Arthur W.
Thayer, William C.
*Tilghman, R. Haughton
Upton, William Kyle
Vernay, Walter H.
*Vickers, J. Kennedy, Jr.
Wagner, H. Wright
Walker, William H.
Watkins, J. Wilbur
Weaver, Francis P.
Weil, Louis
Weiskittel, Francis A.
Wells, Clifton K., Jr.
Wheeler, George J.
White, Chester B.
*Williams, Carroll E.
Willis, Charles F.
Wohlgemuth, Christian, Jr.
Woodall, Robert Earle
Wooden, D. Emory
*Wright, Sumner B.
Young, F. Elmer
Young, Nelson C.

MID-YEAR CLASS OF 1917—51 MEMBERS.

(“Ax” Class.)

Anderson, Charles D., Jr.	Mills, Wm. Norman
Blackburn, Schuyler C.	Mole, H. Rodney
Cardegna, Frank A.	Murray, Edwin E.
Cooling, H. Lowrey	Neiman, Herman
Cowan, William T.	Peoples, Grant N.
Eberley, E. Alvan, Jr.	Phillips, George T., Jr.
*Ehrlich, Roger U.	Plassnig, Edwin
Elste, Albert J.	Pohlman, John V.
Ficht, Carl E.	Reier, Paul G.
Fields, William W.	Roberts, Arthur W.
Fissel, J. Edwin	Schroedl, Walter T.
Gallagher, J. Bennet	Schultz, Fred. E., Jr.
Greenbaum, Leon J.	Smith, George O.
Gressitt, W. Garland	Spedden, J. Cornelius
Grice, C. E. St. Elmo	Tucker, Albert L.
Grubbs, Richard H.	Tumbler, Joseph
Hecklinger, Guy E.	Turner, Webster T.
*Herring, Frank W.	Viessman, Warren
Kern, W. William	Walter, Charles W.
Korpman, Walter W.	Wanicek, John J.
Kratz, Herman C.	Wiesner, Henry F., Jr.
Levy, Abraham Z.	Wood, Robert L.
McComas, J. Roland	Wright, J. Norman
Mahaney, J. Wesley	Wrotten, John F.
Martenet, J. St. Clair	Young, Douglas E.
Meikle, J. Donald	

CLASS OF 1917—169 MEMBERS.

(“B”) Class.)

Abbott, S. Bryan	Barrett, Carlton A.
Acker, Swope	Barrow, Thomas H.
Alrich, Edward B.	Baughman, LeRoy B.
Amick, William Edward	*Baumann, Frank J.
Andrae, Karl H.	Bavis, Edward M.
*Ault, E. Stanley	Benson, Carl F.
Baer, Alfred E.	Bercowitz, Moses
Baker, Foster N.	Berman, Benjamin L.
Baker, Irvin T.	*Berry, Thomas L., Jr.
Ball, Wilmot C.	*Best, Evard P.
Baltz, Charles A.	Bichow, Solomon

- Blunt, Samuel
 Borenstein, Harry J.
 Bowen, J. Gordon
 Boyd, Charles Holmes
 Bramble, Arthur E.
 Broady, Louis M.
 Buddemeier, Harry W.
 Caplan, Philip
 Chenoweth, G. LeRoy
 Cleary, Charles H.
 Colliflower, Howard E.
 Collins, Lewis, Jr.
 Courts, Albert Earl
 Cover, A. Woodland
 Crist, Marion E.
 Crownfield, Frederic R.
 *Cummings, Carl E.
 Cummins, Harold M.
 Diehl, Richard S.
 Earp, Arthur C.
 Eisenberg, Aaron
 Eisenbrandt, Alexander S.
 Elliott, Irving M.
 Eskovitz, Jacob
 Fairbank, Charles W.
 *Faraci, Samuel
 Finkelstein, Abraham
 Franz, Rudolph
 Freedman, Nathan
 Furst, Harold L.
 Gallagher, Joseph
 *Gayhart, Hall
 Givner, Nathan I.
 Goldsmith, Robert H.
 Gordon, Alan L.
 Gordon, Charles V.
 Gordon, Harry
 Grossman, Eugene E.
 Hachtel, C. Leonard
 Hall, Roger F.
 Hament, William
 Hann, C. Bertrand
 Harrigan, Howard H.
 Harris, Paul L.
 Harrison, Joseph M., Jr.
- Hasson, William F. A.
 Heise, L. Randolph
 Hiltner, Millard F.
 Hoffman, Solomon
 *Hopkins, J. Walker
 Hottes, William
 Houghton, Reuben H.
 Iddings, Llewellyn L.
 Israel, Naylor
 James, Arthur V. L.
 Jones, Herbert M.
 *Kahmer, Frederick L.
 Kaufholz, William
 *Keen, George W.
 Kerr, J. Wilson
 Kessler, Joseph
 Kirwan, Emory, Jr.
 Klass, Louis H.
 Knapp, Harold F.
 Knipp, George A.
 Kollmeyer, L. Robert
 Kramer, Hyman
 *Kuff, Ephraim
 Lambdin, Arthur L.
 Laughlin, J. Earl
 Leithauer, George H. E.
 Leslie, Fred. A.
 Levinsohn, Meyer
 Livingston, Stanley O.
 Lucke, Rudolph H.
 McCaghey, W. Lyttleton
 McCauley, Hayward
 McComas, G. Livingston
 McDairmant, John
 McDonagh, Clarence O'C.
 *McElfresh, J. Lister
 Maceubbin, W. Aubrey
 Manfuso, J. Guy
 Michael, Carl F.
 Michel, Maurice A.
 *Mitchell, Alexander
 Mohlhenrich, Randolph R.
 Morgereth, Philip F.
 Morrison, Harry
 Morrow, LeRoy Charles

- Mullikin, Howell B.
 Norment, Clinton C.
 Oler, Albert W.
 Oppenheimer, Kirvin
 Parker, A. Joseph
 Parker, A. William
 Parks, Richard W.
 Paulus, Albert M.
 Pertsch, Charles A.
 Platt, Edgar G.
 Pritchett, Homer M.
 Raffel, Daniel G.
 Ratcliffe, P. Eulon
 Reineke, Lester Henry
 Riddlemoser, Joseph F.
 Riddlemoser, Robert L.
 Ridgaway, T. Norris
 Roesch, Emil
 *Sagal, Marcus
 Schad, Charles I.
 Schapiro, Louis
 Scheer, J. Norman
 Shaftel, Joseph
 Sibley, Leon Taney
 Silberstein, Samuel M.
 Silesky, Abraham H.
 Sinclair, Edward J., Jr.
 *Smith, Albert Van Deaver
 Smith, Louis
- Smyrk, C. Ellwood
 Sunderland, Pearson
 Taylor, H. Leary
 Thomas, William E. M.
 Tobin, James L.
 *Torsch, Frederick F.
 Trout, Jerome B.
 Ulrich, Francis V.
 Vogt, Guilfred W.
 *Wagener, August H.
 Watson, John A.
 Watson, Robert B.
 Watts, B. Rutherford
 Webb, A. William, Jr.
 Weinberger, John
 Wells, R. Norris
 Wensk, Joseph A.
 West, Charles R.
 Wheeden, H. Ford
 Wheeler, F. Edward
 Whitehouse, Hayes
 Wilhelm, John Philip
 Williams, John W.
 *Wimmer, Elmer P.
 Worthington, Lester G.
 Yewell, Earl D.
 Zeman, Charles E.
 Zerhusen, Henry, Jr.
-

MID-YEAR CLASS OF 1918—113 MEMBERS.

(“Bx” Class.)

- Atkinson, Frank V.
 Ballard, Robert F.
 Barr, Harold T.
 Bassford, Norman L.
 Bassford, Wallace L.
 Beiswanger, Elmer J.
 Belt, Samuel Clinton
 Berman, Howard A.
 Bevans, Bertie Bennett
 Bolton, Stewart L.
 Bond, Eugene A.
- Boone, James E.
 Brundick, LeRoy
 Cabe, Melvin Roy
 Codd, James A.
 Codd, Leo
 Cohn, Michael
 Costello, William F., Jr.
 Cox, T. Newell
 Crist, William A.
 Davis, Stanley C.
 Davis, Wm. Ewell, Jr.

- DiDomenico, Anthony F.
Dinsmore, Robert D.
*Dixon, Allan Rhodes
Dorsey, Arthur G.
Dreyer, Albert E.
Drohan, LeRoy W.
Edelson, Leon
Evert, Lawrence L.
Fenneman, Harry F.
Flom, Isaac
Geer, Alfred B.
Gildea, John H., 3d.
Goertz, Walter H.
Goldberg, Samuel R.
Golder, Harry L.,
Goldman, William
Gordon, Eugene
Griswold, Arthur G.
Gross, John J.
Guier, Thomas M.
Habbersett, William C.
Hankofsky, Nathan
Hanzsche, Edward
Harper, J. Sylvester
Hartzell, Roger H.
Hasenkamp, Edgar
Henninghausen, Louis R.
Hibbitts, John T.
Higgins, J. Robert
Hine, Joseph Emanuel
Hobbs, G. Vernon
Hohman, Richmond G.
Jolly, William H.
Kaufman, Carl P.
Kehs, Warren F.
Kelley, J. Joseph
Kollmeyer, C. Albert, Jr.
Krause, William F.
Kulda, Edward J.
Legg, Chauncey M.
Leland, Robert Sulivan
Loewer, Alvin C.
Lotz, Henry Calvin
Lowes, James Tracey
Mangold, William S., Jr.
Meads, Joseph K. T., Jr.
Miller, Hugh
Morgenstein, Morris
Muessen, Anton S.
Neale, J. Shorb
Neavitt, Henry Clay
Nicklas, Andrew F.
O'Keefe, William I.
Peyton, William F.
Pohl, Frederick B.
Pyles, J. Kensett
Raith, Robert M.
Reins, William E.
Richardson, Armond H.
Robertson, Frank B.
Roche, George J., Jr.
Roche, Patrick John
Rouchard, Edward F.
Scheidt, Melvin E.
Scherer, George M.
Schleisner, Samuel
Schmidt, William R.
Schnepfe, Howard A.
Scott, Alfred B.
Scott, Arthur R.
Sendelbach, Frederick J.
Shambach, Franklin M.
Shelley, Franklin C.
Shillman, Abraham
Smith, Edward A.
Sperow, Charles E.
Stansbury, William C.
Stewart, J. Marshall
Stoll, Raymond H.
Tames, Charles H.
Thorington, M. Graham
Tucker, Albert P.
Waddell, William H.
Wallace, Mason L.
Walter, Ernest Wm.
*Webb, Julian S.
Williams, J. McClintonck
Worden, Chester E.
Zeigler, Harold
Zenitz, Nelson
Zimmerman, Robert D.

CLASS OF 1918—239 MEMBERS.

(“C” Class.)

Aaronson, Isidore	Deimel, John
Abbott, Randolph	Dembo, Louis
Adler, Henry	Dettmar, Fred., Jr.
Ashman, George	Dick, George M.
Asnes, Henry	Dietrich, Jack D.
Ballenger, Jack William B.	Dietz, A. Norman
Barnett, Ralph	Dimling, Rudolph G. A.
Becker, David	Dix, G. Parker
Benick, Carroll R.	Droescher, Leroy A.
Benson, William T., Jr.	*Drummond, Wm. Henry
Bergler, Conrad A.	*Dunn, J. Allen
Block, Bernhard A.	Duval, John P.
Blohm, Arthur W. P.	Duvall, Frederick T.
Bolte, Vernon A.	Eberius, Royal W.
Bolton, A. Lyle	Eggleston, J. William
Bortner, Rowland L.	Eisenberg, Benjamin
Breslau, Harold	Elsnic, Emil Wm.
Brodie, Julius	Evans, Frank G., Jr.
*Brown, H. Gassaway, Jr.	Evans, John W., Jr.
Brown, Henry	Fairbank, Ralph W.
Burman, Raymond Wm.	Fallin, Malcolm
Burnett, Norman F.	Fankhanel, Albert W.
Burnham, A. Huntington, Jr.	Feinberg, Bernard
Butler, John M.	Fields, Charles R.
Campbell, Bennett K.	Fine, Isidore
Cash, Edward F.	Fischer, William N. D.
*Cassell, Charles A.	*Fiske, Charles S.
*Chambers, Robert E., Jr.	Fitzgerald, Gordon
Childs, William R.	Fitzgerald, W. Irving
Clark, Wallace K.	*Fleischer, Abraham
Cleghorn, Raymond R.	Foresti, Roy J.
*Clisham, William, Jr.	Freeman, Carroll L.
Cohen, Calvin E.	Fulton, Richard B.
Cole, Dewey	Gallagher, William J. A.
*Collier, Wilbur H.	*Geisz, Henry Fred.
*Comegys, C. Page	Gellerman, Herbert J.
Cook, Irwin M.	Gordon, Samuel
Coscia, Lewis	Gosnell, W. Laurence
Criswell, George D.	Granger, Harry R.
Crockett, C. Clyde	Grimmer, Carl E.
Daniel, Wilson	*Hambleton, R. Waldo
Day, Carl	*Hays, Stanley H.

- Hearn, Bernard C.
 Hecker, Solomon
 Heinritz, George
 Herring, Frank M.
 *Heskett, J. Zachariah
 *Hildebrandt, J. Lawrence
 Hillman, Edward
 Hiss, Bosley
 Holmes, Clarence LeRoy
 Hopps, Linton T.
 House, Robert M.
 Hurwitz, Abraham
 Hurwitz, James J.
 Hyman, Calvin
 Ilgenfritz, Walter C.
 Kaiss, Henry J.
 Kane, Thomas J., Jr.
 Katz, Samuel
 Keller, Harry
 Kendall, Richard C.
 Kerngood, Herbert M.
 Kesting, T. Edward
 Klotzman, Jacob
 *Klingelhoefer, Charles G.
 Knapp, Peter T.
 Kopp, Wm. Leslie
 Krager, C. Harry
 Kratz, William S.
 Lachman, Samuel R.
 Laferty, Paul Edward
 Lamdin, Charles Ridgely
 Lang, Milton C.
 Lee, Richard A.
 Lee, Willard
 Leitner, Clarence W.
 Letzkus, George E., Jr.
 *Libhart, Kenneth V.
 Lindsay, Carey W.
 McCubbin, T. King
 Mahon, William F., Jr.
 Mann, Elsworth F.
 Marden, John Clark
 Margolin, Philip
 Marks, William D.
 Meyer, Joseph J.
 Miedwig, John M.
 Miller, Joseph B.
 Moore, Wm. Hanson
 Moritz, Melvin LeRoy
 *Mortillaro, Louis
 Mugford, J. Edwin
 Mugford, Robert D.
 Murphy, Clarence E.
 Murray, William G.
 *Mutter, Fred. E.
 Neepier, Wm. Nelson
 Nicholson, William K.
 Norman, Oswald B.
 Norris, R. Andrew
 O'Brien, Seymour
 Oehm, F. Arthur
 Ortel, Elmer J.
 Parran, William S.
 Parrish, Charles Howard, Jr.
 Peddicord, Elmer F.
 Pierce, Milton
 Pitt, William W., Jr.
 Plisetsky, Henry A.
 Poehlman, George H., Jr.
 Price, Eugene H.
 Pumphrey, John W.
 Punte, Joseph H.
 Ratcliffe, William O.
 Rau, John Fred.
 Reed, James R.
 Reich, Edwin H.
 Reimer, Paul
 Ricker, Albert
 Ring, George W.
 Ripple, Frank E.
 Roberts, Frank G.
 Rhode, Charles L.
 Rose, C. Jeffries
 Rosenthal, David
 Rosenthal, Joseph S.
 Rosett, Walter
 Rubic, J. Donald
 *Rupp, Walter
 Russell, Edward
 *Sakievich, Anthony J.

Schenkel, Robert D.	Tongue, F. Magruder
Scherr, Nathan	Towson, Joseph P.
Schneider, Kurt A.	Tripp, H. Herman
Schulz, William L.	Van Daniker, Ernault B.
Scrivner, DeLancey B.	Waggner, John H.
Sebald, William F.	*Wagner, Philip
Seiler, Martin	Walden, Fred.
Shank, James S.	Walden, Robert R.
Shapiro, Arthur	Walker, Stanley B.
Shepherd, Ralph	*Wallace, Wm. Lloyd
Silesky, Daniel	Watkins, Douglas
Skrabek, Joseph F.	Watson, Walter G.
Smith, Edward C.	Weaver, Randall Lowe
Smyser, Charles F.	Weinberg, Samuel M.
*Snyder, William E.	Weintraub, David
Soldan, Clarence W.	Weisberg, Henry
Sollod, Hyman	Weiss, R. Glover
Solomon, Charles R.	Weller, Henry V., Jr.
Soper, Elmer E.	Wells, Brent
Stanek, Frank J.	Werner, August D.
Stanfield, Edward F.	Werner, August R.
Steiner, E. Everett, Jr.	West, Kenneth
Stiegler, August	White, Andrew M.
Stinefelt, William J.	Whittington, Robert R.
Stoddert, Francis B.	Whittle, Harold A.
Stoll, Joseph M.	Whyte, Edward C.
Stricker, William T.	Williams, John Harlan
Subock, C. Edward	Willis, Ralph D.
Taubenheim, Frank G.	Woelper, Wm. LeRoy
Teichman, Joel M.	Yaniger, George
Thomas, Alphonso	Young, J. Albert
Thorwarth, William	Ziegenfelder, Herman
Tome, Richard E.	

MID-YEAR CLASS OF 1919—187 MEMBERS.

(“Cx” Class.)

Ackerman, Ernest	Barron, John Henry, Jr.
Albert, Charles Luther	Bavis, Robert Leonard
Amig, William Van Wert	Beach, Robert W.
Archambault, Charles V., Jr.	Becker, Carl F.
Bacon, Geddes Martin	Benson, G. Milton
Barr, John William	Berkemeier, George, Jr.

- Bernstein, Samuel
Bouis, Stanley M.
Bowstead, Charles W.
Brauer, David William
Bresnan, John
Brown, Charles W.
Brown, Frank
Burke, N. Charles
Burrier, Thomas Henry
Bushey, Arthur C.
Buzzell, Berwyn A.
Callahan, Edward J., Jr.
Cann, Bertram B.
Carrigan, Chauncey
Carroll, Charles G.
Cathell, J. Frank
Ceska, Charles J.
Chamberlain, James L.
Christopher, William J., Jr.
Christy, Robert H.
Civis, Joseph A.
Clar, Henry William
Cleaveland, Rentzell D.
Coursey, Robert E.
Creamer, Clarence F.
Crook, Henry, Jr.
Crowley, George B.
*Dederer, George F., Jr.
Diven, Charles E.
Dobe, Henry J.
Disney, Wilson
Dorney, Percy F.
Dorrida, Norman E.
Duvall, Wm. Mitchell
Earp, Lawrence C.
*Edwards, Warwick R., Jr.
Egner, Milton D. M.
Eichberg, Maurice R.
Einbrod, William Carl
Ellis, J. Allard
Engelhaupt, William H.
Eppley, Norman C.
Faimann, Amos V.
Farring, George W.
Field, Bryan H.
Fifer, Wellington C.
Finley, William N., Jr.
Fisher, Benjamin R.
Flannery, John Burke
Fong, Lee
Ford, William O.
Franklin, Harry
Frederick, Wm. E. Everett
Frey, Carroll B.
Frey, Ridgely A.
Gahs, Lockered
Gambrill, William Alban
Griffith, F. Gilbert
Hammond, Carter
Hartman, John S.
Heiss, Arthur J.
Hessler, Andrew J.
Hicks, Robert W.
Hoch, Lloyd M.
Holden, George
Holmes, John
How, Thomas Saulsbury
*Hubbard, Harry E.
Hurley, Harold C.
Insley, Marion C.
*Ireland, Edward H.
Jefferson, William Marvin
Jenkins, Millard A.
Jenkins, William M., Jr.
Jones, Edward
Jones, Lawrence
Kadrabek, Joseph J.
Kauffman, Winfield S.
Kaufman, Isidore
Keller, Walter M.
Kellinger, Albert C.
Kelly, Daniel J.
Kemp, Edwin, Jr.
Kennedy, Edward
Kern, Frederick C.
Kines, William B., Jr.
Kirwan, Jesse Dallas
Kneisch, Rudolph
Kohout, Frank Joseph
Krebs, H. Warner

- Kriel, Stanley M.
Kröeger, Milton H.
Lieberman, Morton W.
Lindauer, Frederick J.
*Logan, Malcolm Roderick
Longan, James A.
Lynch, R. Allan
McCormick, Hamilton L.
McCullough, George Wm.
Magness, Charles H.
Meeks, H. Eugene
Meise, Royden Street
*Mendelsohn, Meyer
Mertz, Walter
Meyer, David N.
Meyers, William C.
Miller, Albert J.
Milligan, Robert Fisher
Mintiens, J. Lester
Moore, Raymond L.
Newton, Howard J.
Nicholson, Alfred C.
Nisbet, Andrew
Parr, Henry C.
Paulus, John N.
Paxton, Kenneth W.
Payne, John A.
Pfisterer, Frank E.
Phelps, Charles V.
Pohl, Louis H.
Pohlman, Walter J.
Pollard, Douglas G.
Potee George N.
Prinn, William Conrad
Pyfer, F. Elmer, Jr.
Rausch, Robert M.
Rice, Gustavus B., Jr.
Robey, Lee Wilmer
Rosenstein, Sylvan
Rudel, Charles Joseph
Rudman, Joseph
Ryan, Joseph James
Saylor, Charles W.
Scheer, Clarence Philip
Schmidt, Robert
Schwartz, John T.
Seibert, Edward
Seitz, Henry
Shaw, Nelson T.
Silverman, Isaac
Singewald, Quentin D.
Skilling, Francis C.
Slocum, John C.
Slowik, Joseph F. F.
Smith, Bernard Roddy
Spintman, Samuel
Spurrier, Earl L.
Steiner, Frederick Wm.
Stenger, Richard E.
Stone, George A.
Storm, Robert Edward
Street, Thomas Bay
Sullivan, Lawrence P.
Sutherland, James B.
Tack, William H.
Taylor, William Walter
Taylor, Zachary
Tebo, Kenneth P.
Tower, Wm. Arthur, Jr.
Trier, Carl L.
Vail, Austin F.
Van Horn, Shirley G.
Von Schulz, Frederick A.
Wallace, Ervin B.
Watkins, Wm. Maurice, Jr.
Weedon, Hugh H., Jr.
Wertzer, C. Edward
Wienert, Adolph C.
Williams, Albert B.
Wilson, Raymond
Wise, Wm. Henry
Wiseman, Wm. Earle
Woods, Howard Joseph
Wright, Arthur C.
Yeager, Harry B.

CLSS OF 1919—449 MEMBERS.

(“D” Class.)

Adams, Clarence T.	Brown, Ryland A.
Alexander, Robert C.	Bruckner, Herman J.
Alrich, Benjamin D.	Bryan, William A.
Anderson, Eric L. S.	Buck, Frank G.
Andrews, William F.	Bunting, George H.
Arnold, Joseph D.	Burgee, Stanley H.
Aubel, John Grant	Busch, Alfred D.
Aylesworth, David A.	Byrn, Charles Nelson
Bachtel, Clifton M.	Canoles, Charles A.
Baggs, Walter M.	Carstens, George Wm.
Baker, Francis M., Jr.	Caulfield, Stuart L.
Ballard, James S.	Cermak, Frank J.
Baney, Edward J.	Chipman, Arthur A.
Barclay, Samuel A.	Claggett, Richard M.
Barker, Melvin Roy	Colgan, George C.
Barnard, Marshall H.	Connellee, Wm. Daniel
Base, J. Edward	Connelly, John O.
Bealis, Joseph C.	Conrad, Philip F.
Bell, J. Milton	Cooke, Gerald W.
Bennett, Eugene	Coster, Francis
Benson, William Hooper	Crawford, C. Lee
Berman, Isador	Crevenstein, Harry
Berman, Paul	Croner, Pierce
Bernstein, Cecil C.	Crout, Wm. North
Bertsch, George T.	Crowther, Franklin G.
Blum, Leonard H.	Cullimore, William H.
Bollinger, Norman	Culver, Edward
Bollman, Charles D.	Cutter, Walter A.
Bookman, Isadore	Danz, Edward C.
Borcherding, Charles H.	Darley, George L.
Bork, Milton F.	Davis, A. Alvin
Bosley, Edgar B. A.	Dawson, George V.
Boyd, Wm. Hunter	DeHoff, John T.
Bradfield, Clarence H., Jr.	Denton, L. Hemsley
Brandt, Gustav A.	DiDomenico, Joseph F.
Brannan, J. Laurence	DiGiorgio, Joseph S.
Bratman, Jacob	Disney, Herbert V.
Bregel, Wilbur S.	DiVincentis, Michael A.
Brittain, Harry L.	Dodson, Charles M.
Brooks, Eugene, Jr.	Donald, Alex. Y. G., Jr.
Brown, George	Donnelly, B. Edward
Brown, Randolph P.	Dougherty, Lawson J.

- Dudderar, Walter A.
Dugan, Joseph H.
Durner, Charles H.
Earle, Carville V.
Eckert, Henry B.
Eckman, Warren B.
Edwards, Howard R.
Edwards, John H.
Edwards, T. Vernon
Ehrhardt, Walter L.
Eikenberg, William
Eimer, Clarence F.
Eisenberg, Isadore
Eisenstein, Samuel
Elgert, Calvin L.
Emery, John M.
Emich, Edward
Eney, G. Howard
Englar, Arthur
Engleman, Frank H.
Eskridge, Ira E.
Eyerly, L. Harry
Fairbank, James Gillman
Falk, Mannie
Fallon, Lawrence, Jr.
Fenkner, Henry K.
Filling, Henry D.
Fine, Phylbert
Flowers, Francis G.
Focke, Arthur
Foos, Hilbert E.
Forster, H. William
Forsyth, George C.
Frank, Paul
Freed, Otto
Freeland, Louis A.
Freese, Charles
Freeze, Frank L., Jr.
Friedman, Jacob
Fuld, Melvin
Fulenwider, Forest F.
Gail, Carl Fred.
Galloway, Raymond
Gardner, Alan K.
Garvey, Joseph M.
Gass, Vernon
Gault, H. Kelcey
Gavin, James J., Jr.
Geiss, Frederick
Geiss, Norman H.
Gerstmyer, Charles N.
Gieske, Alfred Wm., Jr.
Glenn, Sanford N.
Gluck, Earl J.
Goings, John S.
Goldeisen, Cordt A.
Goldstein, Maurice J.
Gorges, James H.
Gorman, Eugene E.
Gorsuch, John T.
Gorsuch, Lawrence H.
Gosman, Harry G.
Gould, Clarendon I. T.
Grace, Howard W.
Graff, James McNeal
Graham, Alfred F.
Grannis, Louis C.
Groves, Charles Earl
Gruehn, Louis J.
Guthrie, Nelson R.
Hall, Albert T.
Hall, Harry A.
Hallam, Henry
Hamilton, George
Harrington, C. Shepard
Harris, Harry
Harris, J. A. Latane
Harrison, Chester E.
Harrison, Henry L.
Harvey, C. Frank
Harvey, E. Walter
Hassan, Joseph A., Jr.
Hawkins, J. Mowell, Jr.
Hawkins, Thomas M.
Haynes, Harry R.
Hellman, Frederick
Henck, Ernest M.
Herbert, Harold G.
Higdon, J. Bernard
Hiser, Clinton A.

- Hochwarth, Frederick
Hoffman, Laurence P.
Hohlweg, William A.
Holloway, James McN.
Hook, E. Sinclair
Hook, Howard A.
Hooper, Robert P.
Hopkins, T. Nelson
Horn, Lewis J.
Hudson, Anthony J.
Hugg, John A.
Hunter, Vernon C.
Huss, Albert B.
Jenkins, Edward A.
Jenkins, Mellville J.
Johancen, Paul M.
Johnson, Albert W.
Johnston, Marriott
Jones, Edgar G.
Kaufman, Roland
Katz, Meyer S.
Keen, George A.
Kellner, Sidney G.
Kelly, W. Leslie
Kennedy, Anthony, Jr.
Kent, J. Hall
Kidd, James K.
King, Charles W.
King, Michael J.
Klaesius, Paul K.
Koch, Karl
Kohlepp, George E.
Koletschke, Herman W.
Krausse, Harry W.
Kreiling, Frederick J.
Krivitzky, Jacob
Kuder, Bernard
Kuethe, Frederick Wm.
Lamberd, Luther S.
Lambert, William McK.
Landram, F. Addison
Larsen, L. Luther
Latimer, Alfred S.
Lauver, William A.
Lawrence, Gordon
Lazarus, Henry
League, Walter G.
Lean, Caldwell
Leeser, C. LeRoy
Levene, Benjamin
Levin, Abraham
Levin, Meyer
Levy, Abraham
Lieder, Adolph M.
Limpert, John Wm.
Lindauer, H. Edgar
Loane, E. Morgan
Loane, Jabez W.
Longfellow, Jenkins W.
Lucy, Frederick M.
Ludwig, Frank J.
Lynch, George W.
McCarthy, Joseph H.
McCleary, Richard C., Jr.
McComas, Donald
McComas, Louis Q.
McCourt, Bernard J.
McDonald, William J.
McGinn, Maurice R.
McNamee, J. Roland
McNeill, Leroy
Machamer, George W.
Mahle, Herbert J.
Mangels, Walter B.
Marcinski, Felix N.
Margolin, Aaron
Marks, George F.
Marshall, Millard R.
Masson, George F.
Matthews, Hugh W.
May, Samuel V.
Meekins, Elmer F.
Melamet, Walter
Mele, Hugo
Mencke, Clarence
Merrick, C. Everett
Meyer, Ehlandt A.
Michael, Lawrence H.
Miegel, Edwin T.
Miketta, Casimir

- Miles, Henry V.
Miller, John H.
Miller, John Kraft
Miller, John Purnell
Miller, Myer
Miller, Nelson D.
Minton, Howard W.
Moisan, Thomas J.
Moore, Garland P.
Moran, Joseph
Morrison, John W.
Mueller, Harold A.
Muhly, Melvin J.
Nechamkin, Harry
Nelson, Leslie
Niles, Harry E.
Noeth, Joseph A.
Nolte, William C.
Nusbaum, Benjamin
O'Dell, Edward C.
O'Neil, Robert E.
Offutt, Harry
Ohrmann, William L.
O'Keefe, L. Herbert
Otto, Francis
Ostendorf, C. Francis
Pabst, Arthur
Patton, Albert M. G.
Penn, Raymond H.
Perkins, Paul R.
Perlman, David L.
Petrik, George J.
Pickett, James W.
Pielke, Bernhardt E.
Pierson, Clarence H.
Pilert, John H., Jr.
Pinkerton, Loys T.
Pledge, Charles W.
Poole, Rudolph A.
Popple, J. Cromwell
Powdermaker, Morris
Powell, Ralph S.
Prince, Charles E., Jr.
Purcell, George O.
Raver, James W.
Rector, Albert W.
Regan, Thomas
Rehling, Herbert H.
Reinhart, Leonard
Reinicker, Glenn F.
Rice, Lawrence B.
Rickerds, Norman L.
Roberts, Joseph C.
Robinson, Benjamin W.
Robinson, James H.
Robinson, Leon
Robinson, Stewart G.
Rodgers, Procter R.
Rogers, Edward M., Jr.
Rose, Julius O.
Rosenfeld, Sol. B.
Rossiter, William V.
Roth, Edward P.
Rothholz, Morris
Ruppertsberger, John D.
Ryan, Cyril J.
Ryan, Dale C.
Ryder, Heithe Chas.
Sack, Charles G.
Sandler, Melvin G.
Sann, J. Carl
Scanland, Alonzo H.
Schaefer, Charles S., Jr.
Schaefer, L. Calvert
Schanze, Conrad G.
Schiaffino, Frank P.
Schissler, Edwin
Schlegel, William W.
Schmidt, J. Edward
Schroeffel, John B. F.
Schubert, Frederick
Schuchts, David E.
Schumann, Wm. Raymond
Schwartz, Israel E.
Schwarz, George M.
Scott, Herbert F.
Sebald, William J.
Seyler, George C.
Shaffer, G. Sylvester
Sheely, Harry M.

- Shiefer, Charles
Shipley Lloyd M.
Shores, Orville J.
Shure, Walter H.
Shutt, Henry LaVerne
Siegmund, C. Gordon
Silk, Herbert J.
Sills, O'Donnell
Simonson, Monroe
Sline, Percy
Slowik, Boleslaus
Smith, Frank M.
Smith, Frederick C., Jr.
Smith, George W.
Smith, Joseph G.
Smith, Louis J.
Snyder, Samuel K.
Sopher, Harry
Sommer, Albert, Jr.
Stapf, August
Stein, Jacob
Stewart, Charles D.
Stewart, Reginald A.
Stiegerwald, Leroy
Stiffler, Russell Leroy
Stimson, Earl, Jr.
Stirling, L. Burke
Strott, John F.
Sugerman, Frank
Swindell, David L.
Tack, Edwin
Talbot, Alcaeus H.
Tanner, William B.
Tarr, Wesley W.
Telford, Marshall H.
Thiess, Frank J.
Thomas, Albert E.
Thomas, David D.
Thompson, Joseph C., Jr.
Thurn, Herbert J.
Tilghman, Wm. Roger
Tillack, Paul O.
Tittsworth W. Buford
Trautman, Robert J.
Trautwein, Herman J.
Trinite, Henry F.
Turpin, Owen W.
Urner, Joseph W.
Utermohle, Charles A.
Valencich, Albert S.
Volkert, Ferdinand A.
Vonhausen, William W.
Von Kleeck, Ernest St. C., Jr.
Voyce, Wm. Edward
Wade, Edward J.
Wagner, George W.
Wagner, Paul J.
Wagner, Walter L.
Wahmann, Charles H.
Walker, Albert K.
Walker, Lawrence G.
Walper, George H.
Walter, Clarence L.
Walter, Eugene
Warfield, Russell A.
Warren, Redmond T.
Wartman, E. Winston
Ways, Roger H.
Wegner, Roland M.
Weikel, Wm. Stuart
Westerman, George L.
Wherley, Charles O.
Whitaker, Hamilton T.
Whitehill, Ivan I.
Whiteley, H. Leroy
Wick, John L.
Wilhelm, Walter L.
Will, Louis H.
Williams, Roy H.
Wilner, Maurice A.
Wilson, John R.
Wilson, W. Robert
Wingard, George M., Jr.
Wise, Albert M. C.
Wisner, Jackson W.
Witzel, Elmer
Wolf, Karl
Wolfe, Charles B.
Wood, William H.
Woodburn, Harry A.

Wright, Edwin F.
Wright, Raymond
Yagella, E. Edward

Yerby, Calvin H.
Young, Paul I.

MID-YEAR CLASS OF 1920—87 MEMBERS.

(“Dx” Class.)

Auer, Robert P.
Bauer, Carl J.
Beer, Eugene H., Jr.
Blumenberg, Albert P.
Bolgiano, Charles A.
Brown, Donald S.
Campbell, Donald R.
Carter, George A.
Childs, Elton Ray
Conroy, John F.
Davis, J. Henry
Deatel, George A.
DeLauder, Thomas A.
Desch, Eugene R.
Dietrich, A. Austin
Dietz, George C. P.
Dorsey, J. Richard
Dreyer, Frederick W
Dudrow, Leroy A.
Eckenrode, Wallace J.
Everitt, Thomas S.
Fisher, John Ford
Fletcher, Raymond
Fonshill, Ira Wm.
Fulton, Charles C.
Gaither, Joseph I.
Garwood, Milton H.
Goehring, Reaves F.
Goldsborough, Richard D.
Gross, George J.
Guidera, Thomas J.
Hanson, Joshua M.
Hendrichs, Martin J.
Higginbothom, Clagett
Holland, John T.
Hubbard, H. Broumel
Kaffeman, Gershon

Knighton, Marshall H.
Konstant, James George
Luther, Edw, Christian
McCahan, Elmer, Jr.
McComas, Frank J.
McFaul, George
Macklin, Charles F. J.
Magarity, Milton J. S.
Mason, Charles S.
Matthews, Leroy F.
Middlekauff, Edward
Morgan, Arthur
Morris, Harry
Myers, Louis
Naudain, Morgan C.
Neale, Edgar Tilghman
O’Malley, Eugene J.
Pavlik, J. Edward
Paxton, Randolph I.
Powell, Frederick R.
Quimby, Dudley T.
Rice, Harold J.
Rigg, Edgar T., Jr.
Ruths, George Wm.
Sandell, Robert E.
Sandler, Hyman
Santilli, Benjamin G.
Sauer, George E.
Schaefer, Henry W.
Schleunes, Carl F. C.
Sebald, Frank J.
Seiler, Henry A.
Seiler, R. William
Settle, Thomas H.
Sheridan, Lawton G.
Small, Frederick R. H.
Smith, Frank H.

Speer, John Carl	Van Horn, Edwin J.
Spitznagel, Wm. Fred.	Warfield, Calvin N.
Storey, Carl	White, Clinton L.
Sullivan, Joseph M.	Wingate, Wm. Russell
Torsch, John B.	Woollen, Earl Bryan
Trott, Samuel L.	Zacharski, Edmund J.
Tyson, Henry F.	

SUMMARY OF ENROLLMENT.

Mid-Year Class of 1916.....	34
Class of 1916, A Class.....	114
Mid-Year Class of 1917, Ax Class.....	51
Class of 1917, B Class.....	169
Mid-Year Class of 1918, Bx Class.....	113
Class of 1918, C Class.....	239
Mid-Year Class of 1919, Cx Class.....	187
Class of 1919, D Class.....	449
Mid-Year Class of 1920, Dx Class.....	87
Total enrollment.....	1,443

CLASS ORGANIZATIONS.**CLASS OF 1916—A CLASS.**

<i>President</i>	John Kirk Bolte.
<i>Vice-President</i>	Charles F. Willis.
<i>Secretary</i>	R. Haughton Tilghman.
<i>Treasurer</i>	Clifton K. Wells, Jr.

MID-YEAR CLASS OF 1917—A-x CLASS.

<i>President</i>	W. Garland Gressitt.
<i>Vice-President</i>	Walter T. Schroedl.
<i>Secretary</i>	J. Norman Wright.
<i>Treasurer</i>	Albert J. Elste.

CLASS OF 1917—B CLASS.

<i>President</i>	J. Lister McElfresh.
<i>Vice-President</i>	Eugene E. Grossman.
<i>Secretary</i>	Albert Van Deaver Smith.
<i>Treasurer</i>	Clinton C. Norment.

MID-YEAR CLASS OF 1918—B-x CLASS.

<i>President</i>	Roger H. Hartzell.
<i>Vice-President</i>	Stewart L. Bolton.
<i>Secretary</i>	Lawrence L. Evert.
<i>Treasurer</i>	Hugh Miller.

CLASS OF 1918—C CLASS.

<i>President</i>	James R. Reed.
<i>Vice-President</i>	Edward Hillman.
<i>Secretary</i>	Wm. Edwin Snyder.
<i>Treasurer</i>	Rudolph G. A. Dimling.

MID-YEAR CLASS OF 1919—C-X CLASS.

<i>President</i>	Earl L. Spurrier.
<i>Vice-President</i>	Carter Hammond.
<i>Secretary</i>	John A. Payne.
<i>Treasurer</i>	Charles E. Diven.

CLASS OF 1919—D CLASS.

<i>President</i>	Herbert J. Mahle.
<i>Vice-President</i>	Paul R. Perkins.
<i>Secretary</i>	Harry E. Niles.
<i>Treasurer</i>	Jackson W. Wisner.

BOARD OF STUDENT ACTIVITIES.

It is the aim to conduct the student activities of the school under teacher supervision, so that the adage "All for each and each for all" may reach the maximum of realization. The student body is represented on the board by the presidents of the third and fourth year classes. The activities and their representatives are:

<i>At large</i>	The Principal and Vice-Principal.
<i>Finances</i>	Mr. Platt.
<i>Football</i>	Mr. Bolgiano.
<i>Baseball</i>	Mr. Dehuff.
<i>Track</i>	Mr. Anderson.
<i>Basketball</i>	Mr. Broadbelt.
<i>Marksmen</i>	Mr. Chandler.
<i>Swimming</i>	Mr. Bolgiano.
<i>Lacrosse</i>	Mr. Ranft.
<i>Tennis</i>	Mr. Hobbs.
<i>Lowell Literary Society</i>	Mr. Caples.
<i>Poe Literary Society</i>	Mr. Spedden.
<i>Franklin Literary Society</i>	Mr. Porter.
<i>Advisor of Literary Societies</i>	Mr. Wills.
<i>Dramatics</i>	Mr. Dehuff.
<i>Polyana Representative</i>	Mr. Arthur.
<i>Music</i> —	
<i>Vocal and Instrumental</i> ..	Messrs. Dehuff, Hobbs, and Ranft.

STUDENT REPRESENTATIVES.

<i>Fourth Year Class (June)</i>	John K. Bolte.
<i>Fourth Year Class (February)</i>	W. Garland Gressitt.
<i>Third Year Class (June)</i>	J. Lister McElfresh.
<i>Third Year Class (February)</i>	Roger H. Hartzell.

LITERARY SOCIETIES.**THE LOWELL.**

<i>President</i>	Carter Hammond, '19.
<i>Vice-President</i>	August Stiegler, '18.
<i>Secretary</i>	Henry Adler, '18.
<i>Treasurer</i>	Emil Elsnic, '18.
<i>Sergeant-at-Arms</i>	E. Stanley Ault, '17.
<i>Reporter</i>	Calvin Hyman, '18. Edward Hillman, '18.
<i>Executive Committee</i>	Harry Buddemeier, '17. Carter Hammond, '19.
<i>Faculty Critic</i>	Mr. Harry L. Caples.

On December 17, 1915, the Lowell Literary Society met defeat in the annual debate with the Poe Literary Society. The subject was: "Resolved, That Woman Suffrage should be adopted in the United States." The Lowell, which upheld the affirmative, was represented by Carter Hammond, Edward Hillman, Henry Adler, and Edward Smith, alternate.

THE POE.

<i>President</i>	William J. Bentz, '16.
<i>Vice-President</i>	Clarence V. Wherley, Mid '16.
<i>Secretary</i>	Nathan Shpritz, '16.
<i>Reporter</i>	David N. Meyer, Mid '19.
<i>Historian</i>	Earl L. Spurrier, Mid '19.
<i>Librarian</i>	Morton W. Lieberman, Mid '19.
<i>Sergeant-at-Arms</i>	Kenneth W. Paxton, Mid '19.
<i>Student Critic</i>	Charles J. Fekl, '16.
<i>Faculty Critic</i>	Dr. Ernest R. Spedden.

The Poe Literary Society has experienced a very profitable and interesting year. In the joint debate with the "Lowell," victory "perched upon the banner" of the "Poe."

THE FRANKLIN.

<i>President</i>	W. R. Wilson, '19.
<i>Vice-President</i>	William Merriken, '16.
<i>Recording Secretary</i>	Louis D. Mortillaro, '18.
<i>Corresponding Secretary</i>	Arthur R. Scott, Mid '18.
<i>Treasurer</i>	Lester R. Culler, '16.
<i>Sergeant-at-Arms</i>	Jeffries Rose, '18.
<i>Librarian</i>	Ralph D. Willis, '18.
<i>Reporter</i>	Alfred B. Scott, Mid '18.
<i>Illustrator</i>	W. A. Lauver, '19.
<i>Critic</i>	Mr. George A. Schwartz.
<i>Faculty Representative</i>	Mr. H. P. Porter.
<i>Play Committee</i>	{ Lester R. Culler, Charles Willis, David B. Sonneborn.
<i>Executive Committee</i>	{ William Merriken, Lester R. Culler, W. A. Lauver, Ralph D. Willis.

In keeping with its original purpose, the "Franklin" has labored to emphasize the social as well as the intellectual phase of a literary society. In consequence, it conceived the idea of giving a Thanksgiving dance—the first ever given at the Polytechnic—which was held in the gymnasium on November 24, 1915.

THE ENGINEERING SOCIETY.

Early in the school year of 1915-16 it was suggested by Mr. Arthur of the faculty and by Douglas Young of the student body, independently of each other, that a society for the discussion of engineering topics be formed. The response was immediate and hearty.

On November 17, 1915, a constitution was adopted and the following named officers elected to serve for the year:

<i>President</i>	Douglas Young, Mid '17.
<i>Vice-President</i>	Emory Rice, '16.
<i>Secretary</i>	Clarence V. Wherley, Mid '16.
<i>Treasurer</i>	Ralph E. McShane, '16.
<i>Faculty Advisor</i>	Mr. James B. Arthur. J. Kirk Bolte, '16. LeRoy Y. Haile, Mid '16. Louis L. Cassard, '16. Charles J. Fekl, '16. William L. Bentz, '16.
<i>Board of Directors</i>	

THE MINSTRELS.

The annual performance of the Poly Minstrels was given at Albaugh's Theatre on December 10th and 11th, 1915. Both performances were largely attended by appreciative audiences. The first night was "School Night" and the second, "Graduate Night". The performances were under the direction of a committee composed of A. King Calder, Samuel Schleisner, J. L. Cassard, Gustav W. Klemm, and Mr. W. A. Dehuff.

BASEBALL.

The 1915 baseball season for Poly was not successful, for well known reasons. It is better to lose with a clean team than win with one containing truants and others who are deficient in scholastic work.

About May 1st, the team was disbanded, the Principal having disqualified seven members of the team (including the Captain) because of truancy and unsatisfactory scholarship. A new call was made for candidates, from which another team was chosen and the schedule completed.

The Record.

Polytechnic.... 7,	Towson High School.....	4
Polytechnic.... 7,	Friends School	9
Polytechnic.... 4,	Pharmacy Dept., U. of M.....	8
Polytechnic.... 4,	Loyola College.....	5
Polytechnic.... 3,	Delaware College	9
Polytechnic.... 5,	Maryland Agricultural College....	7
Polytechnic.... 0,	Tome Institute	6
Polytechnic.... 8,	St. John's College Reserves.....	11
Polytechnic.... 2,	Wenonah Military Academy	7
Polytechnic.... 3,	Washington College	20
Polytechnic.... 3,	City College	4
Polytechnic.... 5,	City College	2
Polytechnic.... 2,	City College	9

FOOTBALL.

For the third successive year Poly won the interscholastic football championship of the city, defeating the City College Team for the title at Homewood Field on November 13, 1915.

The defeats of the season outnumber the victories for the

reason, principally, that Poly stepped out of her class in meeting several of the state college teams.

The Record.

Polytechnic.... 0,	Maryland Agricultural College.... 31
Polytechnic.... 0,	Washington College 30
Polytechnic.... 14,	Shenandoah Valley Academy..... 9
Polytechnic.... 6,	McKinley Manual Training School. 8
Polytechnic.... 3,	St. John's College Reserves..... 14
Polytechnic.... 0,	Wilmington High School..... 0
Polytechnic.... 13,	Baltimore City College..... 0

Carl F. Michael, '17, Captain.

Frank C. Mellon, Coach.

Clarence P. Bolgiano, Manager.

J. N. Galloway, Assistant Manager.

THE MARKSMEN'S CLUB.

The object of the Marksmen's Club is to create among the students an interest in marksmanship, that branch of athletics which develops a steady arm, a quick eye, and a manly self-reliance. It is composed of all members of the school who can shoot or who wish to learn to shoot.

The Club is a member of class "A" of the Inter-City High School Rifle Shooting League of the National Rifle Association, composed of the rifle teams of high schools from all over the United States. The Club last year was unable to raise its standing above that of the preceding year owing to the fact that faulty ammunition was furnished by the State and the added disadvantage of the poor facilities of the range.

The bronze N. R. A. medal was awarded to F. D. Fulton as the winner of the annual members' match. In the interscholastic meet, C. R. Preston was first, winning a rifle, and J. R. Hardin, second, winning a silver loving cup.

TRACK.

The track season of 1914-1915 was the most unique in the history of the sport at Poly. Because of the graduation of every member of the senior relay team the track team had to be built all over again from new material. The fear, however, of an unsuccessful season was dispelled early in the year. During this season members of the team won 35 gold medals, 6 silver medals, 10 bronze medals, and 4 silver cups—a record unequalled by any other Poly track team.

In the State Olympic Championship Contest the Poly senior relay team and the junior relay team won the championship of Maryland in their respective classes. The representatives from Poly won this meet with 65 points, City College being second with 55 points.

LACROSSE.

One of the marked characteristics of the Poly Lacrosse team of the season of 1915 was gameness in the face of overwhelming odds. Though defeated by organizations much stronger, the Poly team showed true Poly spirit and determination.

The Record.

Polytechnic....	1,	Maryland Agricultural College....	7
Polytechnic....	4,	Mt. Washington Athletic Club....	10
Polytechnic....	4,	Johns Hopkins Seconds.....	6
Polytechnic....	5,	Mt. Washington Athletic Club....	8
Polytechnic....	3,	Baltimore City College.....	6

TENNIS.

The season of 1915 was the most successful and at the same time, perhaps, the most disappointing season in the history of this sport at the Polytechnic. Teams from Tome,

Georgetown, Washington College, Gilman, Episcopal High School and City College were met, and, with the exceptions of Tome and "City," were defeated by large margins.

The season of 1916 presents great opportunities to the ambitious players in the student body, inasmuch as the entire team must be rebuilt owing to losses due to the graduation or non-return of some of the best men that have ever handled a racquet for the Blue and Orange.

BASKETBALL.

The team started the season with very bright prospects, but owing to the four-year rule and to the fact that some of the players were deficient in their studies, and were, in consequence, deprived of the privilege of playing, the season was not successful. It was necessary to reorganize the team about two weeks before the City College game, and while a number of enthusiastic players came out the time for preparation was too short in which to develop a championship team.

The Record.

Polytechnic.... 6,	Central Y. M. C. A.....	43
Polytechnic.... 17,	Mt. St. Mary's.....	64
Polytechnic.... 28,	Knights of the Holy Grail.....	12
Polytechnic.... 16,	Paret Memorial Club.....	27
Polytechnic.... 23,	Atlas Club	18
Polytechnic.... 23,	West Branch Y. M. C. A.....	69
Polytechnic.... 47,	Apache Club	14
Polytechnic.... 9,	Friends School	21
Polytechnic.... 26,	Knights of the Holy Grail.....	12
Polytechnic.... 13,	City College	21
Polytechnic.... 19,	Friends School	24
Polytechnic.... 27,	Calvert Hall School.....	9
Polytechnic.... 18,	Western Maryland College.....	39
Polytechnic.... 25,	St. John's Reserves.....	10
Polytechnic.... 17,	City College.....	18

SWIMMING.

The 1915 Polytechnic swimming team successfully defended the South Atlantic Amateur Athletic Union Interscholastic Championship.

The relay team (Duck, Reins, Lamdin and Neale) broke the 160-yard record.

William E. Duck broke the record for 40-yard, 50-yard and 100-yard dashes.

Daniel Raffel broke the record in the plunge for distance.

William E. Reins broke the record for the 50-yard dash, only to have his time bettered by Duck in the finals.

The Polytechnic team also decisively defeated the teams representing the Baltimore City College and Marston's University School in dual meets.

William E. Duck, '15, Captain.

Clarence P. Bolgiano, Manager and Coach.

ELIGIBILITY RULES.

On March 12, 1914, the Principals of the City College and Polytechnic Institute, the two male secondary schools of Baltimore, agreed upon a code of rules which shall govern the eligibility of students of the two institutions to participate in athletics and in other competitions.

The Code.

1. Only those students who maintain a grade of scholarship satisfactory to the Principal shall be permitted to represent the school in competitions.
2. No student who has reached his twenty-first birthday shall represent his school in any competition.
3. No student under the penalty of discipline shall represent his school in any competition.
4. All post-graduates are ineligible for competitions, and no undergraduate shall be eligible for a longer period than four years from the date of his original entry, unless his graduation has been prevented one year by absence on account of sickness.
5. Only those students who are taking full work in a regular course (a minimum of 15 periods per week) shall be eligible to represent their school in any competition.
6. Only those students who are in good standing as amateurs shall represent their school.
7. The Principal of each school shall be held to have ultimate responsibility for the representatives of his school in all matters concerning inter-school contests.
8. All games shall be played on Fridays, Saturdays, or on weekday holidays.
9. All schedules and arrangements for competitions shall be made by members of the teaching staffs of the two institutions, and all officials shall be selected at least two days before a contest.
10. A member of the teaching staff shall manage the finances.
11. A student who does not attain a standard of attendance satisfactory to his Principal may not participate in any contest.
12. A student who enters school later than October 8th must have attended two months before becoming eligible to participate in any contests or competitions.
13. Each Principal shall supply the other within three days of the date of any competition a list of the regulars and substitutes whom it is proposed to use.
14. In all cases of students entering from other secondary schools, their records in such schools shall determine their eligibility in accordance with these rules.
15. February entrants, except they come from other high schools or by promotion from the elementary schools, are ineligible to contest until the following September.

CATALOGUE OF GRADUATES.**CLASS OF '87.**

Clarence G. Bouis,
George C. Bump,
Lucian Dallam,
Otto H. Ehlers,
Osma K. Gardner,
Herbert F. Gorgas,
Joseph Greenbaum,
Henry W. Hahn,
Minor F. Heiskell,
Robert Hooper,
William S. Hugg,
Thomas J. Irons,
Joseph H. Kuehn,

P. Charles Nelson,
Flavius J. Pennington,
Richard Piez,
Henry M. Price,
Walter G. Reinicker,
William A. Robertson,
Albert Rosenberg,
James B. Scott,
Walter R. Sweeney,
James C. Thompson,
Adolphus Tiemeyer,
Frederick H. Wagner.

CLASS OF '88.

Arthur O. Badendrier,
Edward Binswanger,
Bernard H. Brooke,
Sydney S. Bouis,
Julius Fireman,
Thomas G. Ford,
George M. Gaither,
John H. Harvey,
Howard Harvey,
Walter J. Herman,
Joseph H. Hooper,
John P. Jefferson,
William Johnson, Jr.,

William Mencke,
William F. Mylander,
Edwin F. Orem,
Edward B. Passano,
George E. Repp,
Harry E. Roberts,
George C. Robinson,
Hanson Robinson,
Robert E. Rodgers,
George H. Sickel,
Washington B. Stanton,
Orlando C. Weeks.

CLASS OF '89.

William F. Ackerman,	Charles C. Constantine,
Samuel R. Adams,	Albert T. Barrett,
Morgan H. Baldwin,	John L. Ehrman,
Arthur Gordon,	Allyn Field,
Ernest Griffith,	Howard Crosby,
Isaac Behrend,	George W. Moog,
Joseph Isaac,	John K. Mount,
Louis H. Gerding,	Robert W. Peach,
Harry M. Ford,	Charles E. Phelps, Jr.,
Edward P. Cromwell,	William G. Robertson,
John S. Hand,	Robert C. Round,
Claiborne M. James,	Myron S. Rose,
Albert C. Layman,	William C. Siegmund,
Charles W. Leach,	Joseph Stiefel,
J. W. C. Meikle,	Harry P. Suman,
Rozier L. Bouis,	Carroll Thomas.
Robert H. Buschman,	

CLASS OF '90.

John F. Abendschein,	E. C. Harris,
G. S. Barnes,	J. C. Mattoon,
J. H. Bokee,	John D. Pugh,
J. Edward Broadbelt,	A. O. Robertson,
W. H. Farinholt,	William F. Schultz,
Chris. Feick,	Michael D. Schaefer,
J. Froelich,	William P. Shriver,
William P. Gundry,	Theodore Straus.

CLASS OF '91.

Walter Amos,	Samuel McNeal,
Basil Benson,	James C. Phillips,
William Benson,	Herbert M. Reese,
William Boucsein,	Edmund W. Robinson,
Morde Bren,	Iteuben Row,
John J. Caine,	Warren S. Seipp,
George Dannetel,	N. D. D. Sollers,
Charles Ehlers,	Richard S. Warner,
Ferdinand B. Keidel,	William A. Young.
J. Edgar Knipp,	

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 Frank J. Borie,
 B. Harrison Branch,
 Leonard Burbank,
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 Frank B. Hooper,
 Edgar N. King,
 John Langford,
 Louis Liepman,
 R. M. Miller,
 J. W. Dawson, Jr.,

Royal R. Duncan,
 Charles R. Durling,
 Isidor Deutsche,
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 Joseph Mullen,
 William H. Rose,
 Albert G. Singewald,
 William H. Soine,
 William E. Straus,

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 Herbert Addison,
 Oregon R. Benson,
 Percy Thayer Blogg,
 C. Raymond Carson,
 William John Cochran,
 B. C. D'Yarmett,
 Henry M. Fitzhugh,
 Clarence S. Hand,

James F. McChane,
 Clarence F. Morfit,
 F. H. Phelps,
 Edwin Schenck,
 John R. Uhler,
 L. Ismay Van Horn,
 Charles P. Weishampel,
 R. L. Williams.

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 J. Straith Briscoe,
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 Carroll Edgar,
 Frederick Kopp,
 Philip Littig, Jr.,
 Thomas Q. McGinn,
 Herbert A. McGaw,

Horace J. Miller,
 Louis Mueller,
 George M. Parlett,
 Charles Schlicker,
 Alan P. Wilson,
 John Zeubert,
 Pliny Cutler Hall,
 Edward J. Herring.

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Clifton A. Coggins,	Alfred F. Loeser,
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Graham B. Hall,	Herman F. Myer,
William W. Hogendorp,	George N. Rogers,
Albert J. Hooper,	Hamilton D. Ruth,
Frank A. Hornig,	Richard F. Weishampel,
Heward L. Hoskins,	Carl A. Witthaus.
Edward M. Likes,	

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William Augustine Boykin, Jr.,	Harold Vincent Patterson,
Robert Lemmon Burwell,	Harry Clay Powell, Jr.,
Harry Parr Diggs,	Gilmor Meredith Ross,
Frederick L. H. Glendmeyer,	Thomas Quincy Scott,
William Howard Hamilton,	Henry Bonn Silverthorn,
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Fredk. Worthington von Stein,	Roscoe Conklin Sweeny,
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Harry Louis Homer,	Olin Alexander Wilson.
Ludford Cohoon Jones,	

CLASS OF '97.

Louis Fabian Bachrach,	Chester Waters Larner,
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Elvin Griswold Cromwell,	Frederick Lewis Schwartz,
John Towson Elsroad, Jr.,	Joseph Stewart Smith, Jr.,
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Ernest Cummings Hatch,	Joseph Morrison Sparks,
William Hain Kirwan,	Wilson Ward.
Harry L. Kugler,	

CLASS OF '98.

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Alan Joseph Bachrach,	William Charles Metcalf,
Leo Bauerfeld,	John Floyd Miller,
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Frederick Derick Dollenberg, Jr.,	Gurdon Tyler Pollard,
Romulus Griffith Doyle,	Walter Percy Poole,
John Howard Flayhart,	John Maurice Rehberger,
Henry Galloway,	John McCullough Rife,
Charles Raymond Gantz,	Harry Rufus Ruse,
Samuel Thomas Griffith,	Paul Edward Schaun,
Alfred Cummins Hatch,	John Henry Sirich, Jr.,
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Joseph Lowrie Ingle, Jr.,	Herbert Turner Snyder,
John Scott Longnecker,	George Creamer Wilcox.
John Walter McGreevy,	

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Hugh W. Brent,	Charles E. Mencken,
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Charles C. Crockett,	Harold B. Vincent,
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Charles H. Demitz,	John N. McCleester,
Roland S. Focke,	Blakely A. McDonnell,
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Walter B. Lang,	William C. Whelan.
Harry Lowenthal,	

CLASS OF '00.

John Walter Fred. Blizzard,	Luther Chase Wright (see '08)
Roy Stevenson Houck,	Walter Bowen Buttner,
Galt Fayette Parsons,	Morgan Moore,
Gustav Frederick Linck,	John Charles Masopust,
Horace Kirk Faust,	Walter Groverman,
Thomas Osborn Wansleben,	Lawrence Gunton Allbutt.
Samuel Moore Johnson,	

CLASS OF '01.

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Charles F. Goob,	T. Warden Rinehart,
Richard G. Harris, (see '05),	William B. Rosenthal,
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Edward E. Johnson,	Sidney C. Vincent,
Thomas H. Kenny,	George P. von Eiff,
Charles E. Lane,	Ernest B. Walton,
Andrew J. Lowndes,	Arthur S. Weiss,
Ross E. Lynch,	George K. Yost,
Allen L. Malone,	Philip H. Zipp.

POST-GRADUATE CLASS OF '02.

(Four Year Course.)

Joseph M. Beehler,	John A. Raidabaugh,
C. Ernest Conway,	Sidney C. Vincent,
Irving C. Hess,	George P. von Eiff,
Andrew J. Lowndes,	Philip H. Zipp.
Allen L. Malone,	

CLASS OF '02.

Joseph A. Baldwin,	I. Seeley Jones,
Frank O. Boyd,	D. Frank Lamble,
John B. Cautley,	LeRoy M. Langrall,
Robert Dall,	H. Quimby Layman,
William L. De Baufre,	John G. M. Leisenring,
John K. Flick,	William N. Michael,
Walter M. Gieske,	Charles A. Pettit,
Donald S. Hayes,	William S. Samuel,
Joseph T. Henthorn,	G. Forney Shryock,
John S. Hess,	Charles F. Yardley.

POST-GRADUATE CLASS OF '03.

(Four Year Course.)

John B. Cautley,	I. Seeley Jones,
Robert Dall,	LeRoy M. Langrall,
William L. De Baufre,	H. Quimby Layman,
John K. Flick,	Specials —
Walter M. Gieske,	Arthur C. Davis,
Donald S. Hayes,	Charles A. Pettit.
John S. Hess,	

CLASS OF '03.

Elmer Armiger,	Edward Hering,
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Oscar F. Benjamin,	James B. Jones,
Owen C. Blades,	Milton Kraemer,
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Frank B. Burton,	Edmund C. Lynch,
William N. Crisp,	Arthur B. Marston,
John W. Dorsey, Jr.,	Harry M. Mason, Jr.,
Christopher J. Frank,	Sidney Newhoff,
Milton H. Gross,	Manly P. Northam,
Harold M. Parsons,	August H. Schaaf,
Ernest M. Poole,	Howard I. Schultz,
J. McDonnell Reid,	George F. W. Sims,
Martin J. Reynolds,	Wilmer T. Stone.

POST-GRADUATE CLASS OF '04.

(Four Year Course.)

Paul W. Backhaus,	J. McDonnell Reid,
Harry N. Brannan,	Martin J. Reynolds,
William N. Crisp,	George F. W. Sims,
Edward Hering,	Specials—
James B. Jones,	Frank B. Burton,
Milton Kraemer,	H. Milton Gross,
Harry M. Mason, Jr.,	August H. Schaaf.

CLASS OF '04.

Chester A. A. Albrecht,	Herman W. Lasser,
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Marion V. Bailliere,	Leon Marmor,
Joseph Bowes, Jr.,	Samuel May,
Andrew K. Brumbaugh,	John L. Mosher,
Clarence C. Clickner,	Charles P. Niederhauser,
Edward C. Cromwell,	Robert G. Pangborn,
Frederick L. Dixon,	Massimo Pisani, Jr.,
Charles A. Edel,	George S. Robertson,
Frank B. Fifer,	George M. G. Schaefer,
Emanuel Fritz,	Leon Small,
George Gittelsohn,	Oscar E. Smith,
J. Lyell Gressitt,	Marion Steinberger,
Edward J. Hecker,	Harry DeG. Thurlow,
John H. Hills,	Harry Waldorf,
Harry J. Hodes,	Charles W. Whittle,
Benjamin F. Hoffacker,	Edwin L. Wilson,
Harry V. D. Hunt,	Louis A. Witte,
William C. Hurley,	William P. Wittmer,
Charles A. Langrall,	Alexander H. Woollen.

POST-GRADUATE CLASS OF '05.

Chester A. A. Albrecht,	Harry V. D. Hunt,
James B. Arthur,	Charles A. Langrall,
Joseph Bowes, Jr.,	Samuel May,
Edward C. Cromwell,	John L. Mosher,
John W. Dorsey, Jr.,	Robert G. Pangborn,
Charles A. Edel,	Massimo Pisani, Jr.,
Frank P. Fifer,	Leon Small,
Emanuel Fritz,	Marion Steinberger,
J. Lyell Gressitt,	Harry DeG. Thurlow,
Richard G. Harris,	Harry Waldorf,
Edward J. Hecker,	Edwin L. Wilson,
John H. Hills,	Alexander H. Woollen.
Benjamin F. Hoffacker,	

CLASS OF '06.

H. Roy Anderson,	Harold M. Lewis,
Moses Appel,	Bernard A. McAbee,
Walter K. Bachrach,	Carl F. Meyer,
Harry C. Becker,	Sidney D. Mitchell,
J. Ralph Bolgiano,	Ferdinand Oppenheimer,
William Wallace Boyd,	John G. Pertsch, Jr.,
G. Herman Carl,	Lewis W. Porter,
Willis B. Clemmitt,	John T. Ridgely,
Charles H. Dorsey,	John C. Schirmer,
George Erck,	Edward K. Stembridge,
Harry C. Finck,	David B. Stewart, Jr.,
Edwin Friese,	Levin H. Stewart,
John R. Guttmann,	Israel E. Stolberg,
John R. Haswell,	Frank T. Suman,
Charles W. Henderson,	Nicholas C. Thalheimer,
George F. Heubeck,	Raymond M. Weaver,
Ralph Holbrook,	George F. Wennagel,
Andrew C. Kemler,	George F. Weighardt,
Howard G. Lanahan,	Phillip H. Williamson,
George F. Lehmann,	Walter B. Wills.
Frank T. Leilich,	

CLASS OF '07.

Theodore Ascherfeld,
Ludwig Aull,
Emil G. Bauersfeld,
R. M. Bealer,
Alvin M. Bland,
Gustave Bornscheuer,
J. Daniel Brendel,
John N. Childs,
Wilmer A. Dehuff,
C. Lehman Downs,
Herbert S. Fairbank,
F. Donald Fenhangen,
Otto A. Geumann,
Charles E. Grimes,
Henry R. Gundlach,
G. Herman Guttmann,
Carroll R. Harding,
William Hartman,
Horace K. Hayden,
Harry L. Hess,
F. Merill Hildebrandt,
Fernando Janer,
Harry B. Joyce,
John P. Kenney,
Charles Krausse,

W. H. Kruger, Jr.,
William G. McLaughlin,
Laurance F. Magness,
J. C. Manning,
Lawrence G. Miller,
Charles E. Mitchell,
Serafin M. Montesinos,
George T. Mumma,
Marcus Newhoff,
Samuel P. Nixdorf,
Arthur Norden,
Edwin H. Nordmann,
Charles J. Rasch,
Charles J. Ritterhoff,
Ernest Rodemeyer,
Arthur H. Schultz, Jr.,
Nelson Schuster,
Frederick B. T. Siems,
V. Bernard Siems,
Charles Silver,
Samuel F. Tapman, Jr.,
T. Leonard Walter,
Bernard Wich,
R. Mason Wilhelm,
Julius Zieget.

CLASS OF '08.

Otto E. Adams,	Manual Janer,
Gelston H. Armstrong,	Charles R. Justi,
Clarence P. Bolgiano,	Laurence A. Kahn,
Gilbert F. Bolgiano,	Walter E. Lee,
Emmet B. Bryan,	Andrew H. Lemmon,
Joseph D. Bullock,	Frederick W. Lieberknecht,
Nathan R. Butler, Jr.,	Thomas W. Manning,
Walter S. Byrne,	Richard C. Meyer,
James R. Carroll, Jr.,	Robert E. Palle,
Thomas D. Conn,	Mitchell W. Price,
Percy Davenport,	James P. Ray,
Franklin Davis,	Norman G. Reinicker,
Arturo Diaz,	Herbert B. Reynolds,
Austen Gailey,	Norman F. Rigor,
Frank Goldenberg,	Edwin Rolker,
Eugene E. Graham,	Raymon Schlegel,
T. Douglas Gresham,	Christian Schluderberg,
R. Milton Hall,	Othello Schroedl,
Walter L. Heathcote,	Arthur G. Schuster,
Walter F. Heise,	Otto Sima,
Harry C. Hess,	Benjamin F. Starr, Jr.,
Harry W. Hill,	Milton D. Swartz,
Milton A. Hodes,	Walter M. Troll,
Abraham A. Hollander,	Henry Vogt,
Henry J. Horn,	Romaine G. Waltenberg,
Raymond H. Hoskins,	Carl C. S. Walter,
Henry A. Israel,	Luther Chase Wright,
Wilbur C. Jackson,	Frederick A. Zscheuschler.

CLASS OF '09.

Frederick B. Abbott,	Roger C. Knipp,
Oscar M. Bloch,	Gibbs LaMotte,
George C. Borst,	William D. Lambdin,
Frederick Burggraf,	G. Bernard Lohmuller,
Carlton D. Cann,	William J. Mason,
Douglas C. Corner,	R. Brooke Maxwell,
Harry W. Crist,	Henry C. A. Meyer,
William Dalrymple,	Julius O. Mirski,
Louis A. Deliz,	Emory H. Niles,
Frank Fahm, Jr.,	Walter F. Perkins,
Clarence J. Flayhart,	Frederick L. Purdy,
Roy D. Fleckenstein,	Herbert C. Randall,
George C. Fultz,	Paul Rosenthal,
H. Nelson Gambrill,	G. William Schindheim,
Wilson N. Gambrill,	D. William Shilling,
Rafael Garcia,	Harry B. Siegmund,
G. Stewart Giles	Ernest Southerington,
John Glaeser, Jr.,	John Snyder,
William T. Hanzsche, Jr.,	Frederick C. Stauffen,
Elmer Heubeck,	William F. Tapking, Jr.,
Walter E. Higham,	Leroy K. Thompson,
James R. E. Hiltz,	H. Berlin Tinges,
William Vernon Hipsley,	Manual L. Vincente,
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Arthur Janushek,	J. Edward Yewell.
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E. M. Kennard, Jr.,	Philip Waldschmidt,
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Alfred Nisbet,	Russell D. Welsh,
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Leo Blankman,
Jacob Blaustein,
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George Johnson,
William B. Johnston,
Edwin F. Koester,
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August J. Kutzleb,
Joseph H. Letzer,
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Thomas M. Linthicum,
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William N. Neibich,
Dudley F. Nicholas,
Frank Neumann,
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Henry R. Rausch,
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Arthur Rhoads,
John K. Ruff,
Albert H. Samuel,
Henry F. Schneider,
Jacob Schmidt, Jr.,
L. Wilson Scott,
Charles L. Steel,
George W. Tall, Jr.,
Perry M. Teeple,
Carroll A. Turner,
Leo Tyser,
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M. Leeson Walsh,
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F. Carey Williams,
John A. Woodfield,
P. Chancellor Wroe,
Roy A. Yingling.

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Charles L. Maas,
Samuel P. Stewart, Jr.,
Jay W. H. Stoudenmire,
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George W. Black,
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Alan F. Bristor,
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Walter A. Brown,
Charles S. Burlingham, Jr.,
J. Ford Coursey,
Charles R. Cox,
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G. Middleton Edwards,
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J. George Forster, Jr.,
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Irving Hoffman,	W. Norman Wherrett,
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Harvey F. McLaughlin,

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| Peter A. Lapetina, | Vance Vernon Wilson, |
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H. Lee Hoffman,
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H. Irvin Kellner,
Paul B. Kelly,
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